WAGES, PROFITS AND PRODUCTIVITY

IN

SELECTED INDUSTRIES OF INDIA

SINCE 1950

A

THESIS

SUBMITTED FOR THE

DOCTOR OF PHILOSOPHY IN

ECONOMICS

OF

THE

UNIVERSITY OF ALLAHABAD

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SATISH CHANDRA SRIVASTAVA

P R E F A C E

In a developing economy like ours, which aims at rapid economic development together with a fair improvement in the living conditions of the poorer sections of the society specially workers, it is necessary to have a clear idea about the relationship that exists between wages, profits and productivity. Because, in a dynamic setting of a growing economy not only the entities of wages, profits and productivities are subject to change, their relationships also vary with the times. And the nature of relationships between these entities have a great deal to do with shaping the course that development might take. The present study is therefore, an attempt to discover the nature of these relationships for a few selected industries.

The present study covers mainly the Post-Independence period from 1950 to 1964. To arrive at certain results, at attempt has been made to apply various statistical techniques. The data used in this thesis have been taken mainly, from Government of India's publications.

The scheme of work runs as follows:

In Chapter One, along with the introduction of the main thesis, the criteria to select the industry from amongst the total number of industries in India are discussed. Thereafter, a separate chapter is allotted

problems, employment and wage-structures, relationship of wages and Consumers Price Index Number and productivity and wages in relation to profits. Chapter Ten, the last, sums up the various results and conclusions. The foot-notes and references, which are on the basis of numbers of books, articles and journals etc., put in double brackets, of bibliography are appended in the end. Graphs are appended in the last before the bibliography and main tables and limitations appendices are put in the appendix.

I wish to express my gratitude to the sources, wherefrom I have borrowed profusely the data and the matters, for this work. But the debt which I owe to Sri Suresh Chandra Pant, my advisor, is of a different nature and is the greatest of all. It was under his valuable guidance that I could pursue this research programme, and but for his encouragement and constant help it could not be completed. Again, it would be a serious omission on my part not to record here my respectful thanks to my revered teacher Shri Mahesh Chand, who has always remained a source of inspiration and help in the completion of this study. My debt to Dr. R.D.Hajela, Dr. J.S.Mathur is so great that nothing short of dedicating this work to them can properly requite it.

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Last, but not the least, I shall be failing in my duty as a student and a brother, if I did not acknowledge with gratitude the strenuous work put in by my younger brother, Mr. Akhilesh Chandra Srivastava, B.Sc., Ag.Engg. M.Tech(Pharm. Mach), on the statistical computation, tracing of graphs and in several other forms.

I am also deeply indebted to the management of my college, without whose kind permission, the study might not have come to any fruition.

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Kartik Purnima, 2028.

C O T E N T S

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LIST OF APPENDIX TABLES

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LIST OF FIGURES

'*' The code Number indicates the Chapter by the number before the point and the number of the figures within the Chapter by the number after the point.

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KEY TO MATHEMATICAL NOTATIONS

Small Letter	Capital Letter	Name
α	A	alpha
β	B	beta
γ	Γ	gamma
δ	Δ	delta
λ	Λ	lambda
ρ	P	rho
σ, ς	Σ	Sigma
ϕ	Φ	phi
χ	X	Chi(pron.ki)

KEY TO ABBREVIATIONS

A.S.I.	:	Annual Survey of Industries.
A.D.E.	:	Average Daily Earnings.
C.M.I.	:	Census of Manufacturing Industries.
C.P.I.	:	Consumers' Price Index Number.
C.W.B.	:	Central Wage Board.
D.A.	:	Dearness Allowance.
F.F.Y.P.	:	First Five Year Plan.
F_{th}. F.Y.P.	:	Fourth Five Year Plan.
I.L.S.	:	Indian Labour Statistics.
I.L.O.	:	International Labour Organisation.
I.L.G.	:	Indian Labour Gazettee.
I.L.J.	:	Indian Labour Journal.
M.C.C.	:	Multiple Correlation Coefficient.
N.A.	:	Not Available.
O.W.S.	:	Occupational Wage Survey.
P.M.	:	Per Month
R.B.I.	:	Reserve Bank of India.
S.F.Y.P.	:	Second Five Year Plan.
T.F.Y.P.	:	Third Five Year Plan.

CHAPTER I

INTRODUCTION

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1:1 In the proposed study an attempt has been made to study the ' Wages, Profits and Productivity in selected industries of India, since 1950- [illegible]". A study of changes in relative wages in relation to changes in productivity and profits is important not only from the point of view of workers, but also from the point of view of the industries concerned. The tasks, I have set for myself here are mainly four:

(i) Firstly, to present a picture, as far as possible, of the existing state of wage-differentials.

(ii) Secondly, to study the relationship betwe n wages of the employees and productivity.

(iii) Thirdly, to determine the individual and combined effect of Consumers Price and Productivity (i.e. value added per person).

(iv) Fourthly, to study the relationship between profits and wages in the selected industries. Here, no attempt has been made to arrive at a quantitative measure of the relationship, because of non-availability of precise and uniform data on profits.

It seems that semi-aggregative study of this type are important from theoretical as well as practical point of view. They are important from theoretical point of view because they constitute the missing links between the micro-economics and macro-economics. They are also important for an understanding of the inter-industry differentials in

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a growing economy like ours, where there are such old and well established industries as Cotton Textile, Jute Textile etc., and such new industries as Iron and Steel Industry and Paper and Paper Boards Industry.

It would not be out of place to give a brief history of the work done in this field in India. In a developing economy like ours, the development of one section of the community is a resultant of various inter-linked forces and policies, viz., Price Policy, Fiscal and Monetary Policy, Labour Policy etc., of the Central and State Governments. Moreover, the unions of the people, social customs, rituals also play important roles in the development of that section of the Economy.

In India, whose 70 percent of the people constitute labour class, the objectives of labour and social welfare policies (i.e. wage-policy) automatically draws the attentions of the people, i.e. researchers, politicians & acadamicians.

In such a society the objective of the wage-policy should be to provide a rising level of real wages with a view to building up a physically and morally healthy working class and an atmosphere with healthy relations without, at the same time, undermining the overall objective of growth with stability. Government in their statement of Industrial policy issued on 6th April 1948, inter alia, included two items which have a bearing on wages:

(i) Statutory fixation of a minimum wage in sweated industries, and

(ii) promotion of fair-wage agreements in more organised ones.

In pursuance of the first objective, the minimum wages Act was pass d in 1948, covering agriculture and 12 others industries. For the second, the Government appoint d a Committee on Fair-Wages, a tripartite body, to evolve principles for the determination of fair wages.

To emphasis the same need, the planning commission in its report on the First Five-Year-Plan recommended the establishment of v rious permanent wage boards (Cotton Textile, Sugar, Cement etc.,) tripartite in composition, both at the centre and in the states to "deal comprehensively with all aspects of the question of wages, to make suitable necessary enquiries, collect data, review the situation from time to time and take decisions regarding Wage adjustments sue moto or on reference from parties or from the Government" ((2)), ((1)).

The above recommendation was considered by the Indian Labour Conference, at its Thirteenth Session in 1954, which suggested the setting up of Wage-Boards at the Central Level. In the absence of progress in this direction, Second Five Year Plan, 1956, re-emphasised the need to establish wage Boards to determined wages and conditions of employment.

"The existing machinery for the settlement of disputes namely, the Industrial Tribunals, has not given full satisfaction to parti s concerned. A more acceptable machinery for settling wages disputes will be one which gives the parties themselves a more responsible role in reaching decisions.

An authority like a tripartite Wage Board, consisting of equal representatives of employers and workers and an independent Chairman will probably ensure more acceptable decisions. Such Wage Boards should be instituted for individual industries in different areas". ((75,p 580))

Pursuant to the recommendations of the Second Five Year Plan, the Government appointed the First Central Wage Board for the Cotton Textile Industry and several other Boards like Cement, Jute etc., in the years 1958,1959 etc. ((2, p 4)).

In India the work of Dr. Radha Kamal Mukherjee, Prof. Dunlop, Dr. Raghuraj Singh, Dr. S.K.Palekar, Dr.B.N. Datar, and National Council of Applied Economic Research can be treated as important as the work of Prof. LLyod. G.Reynolds and Cynthia H.Taft, - "The Evolution of Wage Structure" in the context of industrial labour in United States of America and that of R.A.Lester in England, whereas Dr. Fonseca A.J., has studied the Wage Theories in the context of workers, trade unions effects on wages etc., in his 'Wage Determination and Organized labour in India", ((13)), Dr. Palekar has studied the wages in the context of productivity, profit, capital-formation and employment for a period of 8-9 years after independence for the entire industrial labour in India on the basis of empirical data. Dr. C.K.Jauhari and N.C.Agrawal have very beautifully sketched the 'Inter-industry Wage-Structure in India, 1950-'61,." work of Dr. O.S.Srivastava, titled

"Wages, Employment and Productivity" has only ~~to~~ been able to present a brief sketch of the problem, theoretically.

Some of the universities, research centres and private bodies are also engaged in the study of interesting problems of wage of industrial labour, who have not been given due importance either in society or in the development of the economy of the country.

National Council of Applied Economic Research, New Delhi, has studied the occupational wage-differentials in some of the industries, viz., Cotton Textile, Sugar, Iron & Steel, Tea and Automobile etc., It has attempted to depict the differentials in earnings of men, women and children in context of the place, cadre, plant and industries. Inter-industry, Inter-state differentials have been studied in this study.((10)). The main study undertaken by National Council of Applied Economic Research had two aims. First, to present as faithful a picture as possible, of the existing state of Wage-differentials. Second, to analyse what has been happening to Wage-differentials over the years. The National Council of Applied Economic Research have taken the help of the statistics of Government of India, Reports of Central Wage Boards etc.,

On similar line, Sri Ram Centre of Industrial Research, Delhi is busy in analysing the problems of Wages of the Industrial Labour. Dr Miss Kamla Mathur, Chairman of Committee on Automation, Delhi has done pioneering work in

this field.

Moreover in India, but in other countries also like Sweeden, France, Britain, Holland, Australia, United States of America and number of other countries, the work of above nature viz. wage structure, wage policy, relative wages is being frequently carried on.

The International Labour Organisation (I.L.O) and United National Economic Comission for Europe have given impetus in this field by carrying on comparative studies for national wage structure. The attempt of conference of International Economic Association (1954), which has devoted papers on Wage determination, is not less important in this field.

1:2 In order to present a study of the semi-aggregative type, Eight industries viz. Cement, Cotton Textile, Woollen Textile, Jute Textile, Sugar, Matches, Paper and Paper Boards and Iron and Steel Industry, have been selected for detailed study; the criteria of selection of these industries are their importance in the economy, size of employment of the industry etc. The industry selected are mostly private enterprises, excepting Iron and Steel (and now Sugar, also after nationalization). Cement industry has been selected ~~the~~ on the ground that it plays the most important role in the development of economy and a good number of persons are employed in this industry. Cotton-Textile, Woollen-Textile, and Jute Textile are the industries of Textile groups which has been solving the problem of clothing and packing for a pretty long time. Moreover, these are the biggest employers as well as

foreign exchange earners. They are important, as they produce consumer goods, Sugar, the seasonal industry, employing less technology and more unskilled labour, has been selected on the basis of its nature of dependence on agriculture. Match Industry, is one of the neglected industry of unorganised nature and that is why it has been selected. Paper and Paper Boards and Iron and Steel are the newer and developing industries. They form the pivot of education and modern industrial society.

The present study is composed of 10 Chapters. The First, the introductory Chapter is followed by Eight Chapters dealing with individual industries,one Chapter for one Industry. These chapter s of individual industries are divided into sections and sub-sections, in which relative importance, characteristics and problems of the industry, employment - structure, wage-structure - Wage differentials on the basis of sex, place, plant, cadre, skill, industry, productivity and profits have been studied. In the last Sections of these Chapters conclusions of the chapter has been given. In Chapter Ten, the last, there is a summary of the results obtained for individual industry and also an attempt has been made to discuss inter-industry differentials. In these chapters covrelation between wages of workers and value added; total earnings trend, total earnings in relationship of Consumers Price Index Number and Productivity Index Number (on the basis of multiple correlation), and Linear Logarithmic regression of production, wagesand productivity with respect of size of establishments on the basis of employment((Table 2:10))

(§60, 1958)) have been given in the statistical part, of the discussion. The validity of statistical results are tested by tests like, χ^2-test, t-test, F-test generally at 5 % level of significance. A brief mathematical explanation of these statistical tools and tests have been given in the section given below.

1:3. 1 DEGREE OF FREEDOM

The number of independent variables, or the number of variables that can vary freely, or the number of variables that can be chosen freely is called the degree of freedom.

Let us discuss this idea heuristically. Suppose, we have two numbers X_1 and X_2, where

$$\overline{X} = 1/2 \ (X_1 + X_2) = 5$$

Then, for examples, we may have,

$$X_1 + X_2 = 3 + 7 = 10$$

$$X_1 + X_2 = 4 + 6 = 10$$

$$X_1 + X_2 = 2 + 8 = 10$$

and so forth. We can see that once the first number X_1 has been selected, the second ~~under~~ number X_2 is automatically determined, because the average has been set at 5. So, in this case, we are free to set one variable and the other will be determined, which in the statistical language may be denoted as,

$$(2 - 1) = 1, \quad \text{degrees of freedom}$$

Similarly, if there were three variables to be determined we would be free to set 2. The third is automatically set

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which may be (3 - 1) = 2 degrees of freedom.

In the same manner, if the number of variables to be determined are n, then we are free to set (n - 1) variables. The n^{th} will be set automatically. In other words degrees of freedom in this case will be (n - 1).

Thus, when we have pooled variance or multiple regression,

$$\sigma^2 = \frac{n_1 s_1^2 + n_2 s_2^2}{n_1 + n_2 - 2}$$

the degrees of freedom are ($n_1 + n_2 - 2$). This is because S_1^2 has n_1 variables, but with a given mean, and thus ($n_1 - 1$) free variables, likewise for s_2^2. Thus, the number of free vatiables is (n_1-1) + (n_2-1). This reasoning extends to the general case when we had ϕ = u - k degrees of freedom. ((38)).

1:3(ii) GOODNESS OF FIT. ((38, 84, p.391, 505, 461-62))

It is a test of the agreement (or confirmity, or consistency) between a hypothetical and sample distribution. Pearson's approximation, which is given by,

$$\chi^2 = \sum \left[(n_i - np_i)^2 \;/\; np_i \right]$$

mey be shown schematically as ,

$$\chi^2 = \sum \left[(O_y - E_y)^2 \;/\; E_y \right]$$

where, O_y is the observed and E_y is the expected frequenty . This Chi-squared may be considered as a measure of discrepancy between O_y and E_y. If there is no discrepancy,

between O_y and E_y, then $\chi^2 = 0$. As the discrepancy becomes larger, the becomes larger. The χ^2 values are evaluated by the χ^2 distribution.

The format of the goodness-of-fit tests is as follows:

(1) State the null hypothesis, which is usually, the sample, distribution agrees with the hypothetical (theoretical) distribution.

(2) Determine the level of significance. We will use 5 percent in our tests.

(3) Calculate χ^2 and determine the number of degrees of freedom. The five percent level of significance and degrees of freedom will determine the region of rejection.

1:3.3 In respect of each of these industries as stated earlier, we will study the trends in total yearly earnings, over the fifteen year post - independence period from 1950 to 1964. The statistics used are obtained from Census of manufacturers (1950-'58) and Annual Survey of Industries (1959-'64), published yearly by the Government of India ((60, 61)).

An attempt was made to fit a linear trend with respect to time, but as the error turn was larger and fit was not good, it has been rejected. That is why it was considered to try to fit a parabolic trend of second degrees. Since, the second difference of the dependent variable(Y), defined as,

$$\Delta^2 Y_i = \Delta Y_i - \Delta Y_{i-1}$$

was almost nearly constant and satisfied the conditions of line of best fit, in all the industries under study. Therefore, it is inferred that parabolic eqqution of second degree will be best fit with minimum error terms ((Chapters 2 to 9, sections: 4, vide figures 2:1 to 9:1)). The parabolic equation may be given as,

$$Y = a + bt + ct^2$$

where, Y stands for average yearly earnings in terms of money of the employees of the each industry, t for time measured in years with reference to 1957 as origin, b and c being trends and accelerations, respectively.

Further, the χ^2-test is applied to test the goodness of fit of the trend. χ^2 test, which is the test of the agreement (or consistency or confirmity) between a theoretical (hypothetical) and sample distribution. ((for details please see section 1:3.2))

1:3.4 It was thought proper to study the relationship between wage bills and production (value added), for which linear regression of (i) X (total yearly wage bills) on Y (Value added) and (ii) of Y(value added) on X (total yearly wage bills) respectively, is calculated by the help of least-squared method in Census of Manufacturers' (1950-'58) and Annual Survey of Industries (1959 - 1964) data for a period of 15 years from 1950 to 1964. The respective regression equations may be,

$$X = a + bY \quad --- \quad \text{(i)(Vide Sect: 5:5.1)}$$

and

$$Y = c + dX \quad \ldots \quad \text{(ii)(Vide Sect. :5.2)}$$

calculated.

The coefficients of regression b and d (normally denoted by b_{xy} and b_{yx}), are tested for significance by t-test. The quantities,

$$(b_{xy} - \beta_{xy}) \sqrt{(n-2) \quad \Sigma(Y-\bar{Y})^2 / \quad \Sigma(X - \bar{X})^2}$$

and

$$(b_{yx} - \beta_{yx}) \sqrt{(n-2) \quad \Sigma (X-\bar{X})^2 / \Sigma(Y-\bar{Y})^2}$$

are distributed as t, each with (n-2) degree of freedom, where β_{xy} and β_{yx} denote the regress coefficients in the population from which the regression data are drawn.

The hypothesis in the two cases will,respectively be,

$$\beta_{xy} = 0 \qquad \text{and} \qquad \beta_{yx} = 0$$

<u>1:3.5</u> Correlation between wages of workers and value added for each industry, for a period of 15 years (excepting Paper and Paper Boards for which period is only 10 years i.e. from 1950 to 1959, only for Census of Manufacturers data) has been calculated by the Karl Pearson's formula, in Census of Manufacturers and Annual Survey of Industries Data,

$$r = \frac{\Sigma xy - n \; (\Sigma x/n)\;(\Sigma y/n)}{n\sqrt{\left\{ (\Sigma x/n \;) - (\Sigma x/n\;)^2 \right\} \left\{ (\Sigma y^2/n) - (\Sigma y/n)^2 \right\}}}$$

The significance of 'r' is tested by the use of t-test and also by use of correlation coefficient table (i.e.r-tables).

(i) The value of 't' under the hypothesis that correlation coefficient ρ in the population is zero, is given by

$$t = r \Big/ \sqrt{(1 - r^2) / (n - 2)}$$

which has 't'-distribution with $\phi = (n-2)$ degrees of freedom.

(ii) for the use of r-table see Taro Yamana's Book ((38))

1.3.6 Total yearly earnings of the ~~employees of the~~ industrial labour has been analysed by Consumers Price Index Number and productivity index number. Here, also we have fitted a linear regression,

$$Y = a + b_1 X_1 + b_2 X_2$$

where Y = Index Number of total yearly earnings *base 1951= 100,

X_1 = Consumers Price Index Number, Base 1951=100

X_2 = Index Number of productivity, Base 1951=100

Besides, consumers Price Index Number and Productivity Index Number, there can be other factors also -- both, economic and non-economic, like Government's interference, degree of Trade Unionization etc. ((13,25)) etc., -- but we have assumed that the changes in the total earnings of an employee of an industry are the combined effect of only two factors, namely, consumers Price Index number and productivity Index Number. Total yearly earnings of an employee are treated as a

* The year 1950 has been left in the analysis, only because of the fact that Consumers' Price Index Number were available at base as 1951.

a dependent variable (a variable to be estimated) and is supposed to be influenced by two independent variables mentioned above. The multiple linear regression equation,

$$Y = a + b_1 X_1 + b_2 X_2$$

will explain Y in terms of X_1 and X_2.

The coefficients b_1 and b_2 (normally written as ($b_{y1.2}$ and $b_{y2.1}$) are termed as partial (or net) regression coefficients. In other words, these coefficients show the relation of Y to X_1 and X_2 respectively, excluding the associated influence of the other independent variables. They show the average increase in Y for unit increase in X_1 and X_2.

The significance of partial regression coefficients $b_{y1.2}$ and $b_{y2.1}$ is tested by the help of the t-test. The quantities,

$$(b_{y1.2} - \beta_{y1.2}) \sqrt{(n-k-1) \ \Sigma(X_1 - \bar{X}_1)^2 / \Sigma(Y-\bar{Y})^2}$$

and $$(b_{y2.1} - \beta_{y2.1}) \sqrt{(n-k-1) \ \Sigma(X_2 - \bar{X}_2)^2 / \Sigma(Y-\bar{Y})^2}$$

are distributed as t, each with (n-2) degrees of freedom (as k=1), where $\beta_{y1.2}$ and $\beta_{y2.1}$ denote the partial regression coefficients in the population from which the regression data are drawn.

The hypothesis in the two cases will, respectively, be

$$\beta_{y1.2} = 0 \qquad \text{and} \qquad \beta_{y2.1} = 0$$

Here, since the estimate will be based on two variables, the relative importance of these variables combined is measured

by coefficient of multiple correlation, denoted by $R_{y.12}$, where the subscripts indicate the variables involved. This coefficient will express the degree of linear relationship between the variables Y (in our case index of total yearly earnings of an employee of an industry) and two variables X_1 (Consumers' Price Index Number) and X_2 (Productivity indices). This coefficient is defined,"as the simple correlation between the actual Y values and the Y values estimated from the multiple-regression equation .... $R_{y.12}$ is the square root of the fraction of the sum of squares in Y accounted for by the regression equation" ((38,11)). Symbolically

$$R_{y.12} = \sqrt{\Sigma(Y' - \bar{Y})^2 \;/\; \Sigma(Y - \bar{Y})^2}$$

where "the numerator of the radicand is n times the sum of squares of deviations of the fitted points from the mean of Y's. The denominator is n times the total sum of squares in Y ". ((38,11)).

The coefficient of multiple correlation, thus calculated has a tendency " to be in excess of the correlation existing in the universe from which the sample is drawn, specially where the number of observations is small or the number of variables large"((11, p,211)). For this reason $R_{y.12}$ is some time called the unadjusted coefficient of multiple correlation.

The square of $R_{y.12}$ is known as the coefficient of multiple determination and it has more meaning than $R_{y.12}$. As Ezekiel says, " It is evident the the coefficient of ~~higher~~ multiple correlation if incorrectly interpreated.

a dependent variable (a variable to be estimated) and is supposed to be influenced by two independent variables mentioned above. The multiple linear regression equation,

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will explain Y in terms of X_1 and X_2.

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$$(b_{y1.2} - \beta_{y1.2}) \sqrt{(n-k-1)\ \Sigma(X_1 - \bar{X}_1)^2 / \Sigma(Y-\bar{Y})^2}$$

and $$(b_{y2.1} - \beta_{y2.1}) \sqrt{(n-k-1)\ \Sigma(X_2 - \bar{X}_2)^2 / \Sigma(Y-\bar{Y})^2}$$

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by coefficient of multiple correlation, denoted by $R_{y.12}$, where the subscripts indicate the variables involved. This coefficient will express the degree of linear relationship between the variables Y (in our case index of total yearly earnings of an employee of an industry) and two variables X_1 (Consumers' Price Index Number) and X_2 (Productivity indices). This coefficient is defined,"as the simple correlation between the actual Y values and the Y values estimated from the multiple-regression equation .... $R_{y.12}$ is the square root of the fraction of the sum of squares in Y accounted for by the regression equation" ((38,11)). Symbolically

$$R_{y.12} = \sqrt{\Sigma(Y' - \bar{Y})^2 / \Sigma(Y - \bar{Y})^2}$$

where "the numerator of the radicand is n times the sum of squares of deviations of the fitted points from the mean of Y's. The demominator is n times the total sum of squares in Y ". ((38,11)).

The coefficient of multiple correlation, thus calculated has a tendency " to be in excess of the correlation existing in the universe from which the sample is drawn, specially where the number of observations is small or the numb of variables large"((11, p,211)). For this reason $R_{y.12}$ is some time called the unadjusted coefficient of multiple correlation.

The square of $R_{y.12}$ is known as the coefficient of

makes the relationship seem closer than does the coefficient of multiple determination. It cannot be demonstrated that the coefficient of multiple determination will measure in all cases that proportion of the variance in the dependent factor which is associated with the independent factors. Yet, it is sufficiently true, so that, if such a statement is to be made as "seventy five per cent of the variance in income was associated with (or related to) variances in numbers of acres farmed, or cows milked, and men hired", it is more accurate to use the coefficient of multiple determination ~~them~~ than that to use the coefficient of multiple correlation. ((11)).

The coefficient of multiple correlation, as explained above, has been calculated in case of the employees total yearly earnings for individual industries under study. If the correlation coefficients is exceptionally high, it will mean that quite a high percentage of the variation of Y can be accounted for by the linear regression on the variables X_1 and X_2. The rest is explained by other factors, not taken into account. Further, the F-test is applied to test the significance of $R_{y.12}$, or in other words, to test the hypothesis that the population coefficient of multiple correlation, $\rho_{y.12}$, equals zero((11,38 84)). The value of F is given by,

$$F = \frac{\text{Variance explained by regression equation}}{\text{Residual variance.}}$$

The degrees of freedom are K(representing the number of variables eliminated) and (n-k-1).

In order to find out F, use will be made of the following table:

TABLE ONE

ANALYSIS - OF - VARIANCE SUMMARY FOR MULTIPLE REGRESSION PROBLEM

Source of variation	Sum of squares	Degrees of freedom	Mean square
1	2	3	4
Total	$\sum (Y - \bar{Y})^2$	$(n-1)$	
Linear Regression	$\sum (Y' - \bar{Y})^2$	k	$\sum (Y'-\bar{Y})/k$
Residual from Regression	$\sum (Y - Y')^2$	$(n-k-1)$	$\sum(Y-Y')^2/(n-k-$

Therefore,

$$F = \frac{\sum (Y'-\bar{Y})^2 \;/\; k}{\sum(Y-Y')^2 \;/\; (n-k-1)}$$

1:3.7 Now, to study the relationship betweem wages and productivity according to the size of establishment with respect to employment((18,pp110-135)) a linear logarithmic regression of Y (Log P, value added) on X (Log P/W, productivity i.e. value added per person) has been calculated for O.W.S (1953) data by the ((73)) method of least square. Equation is of the form,

$$Y = a + bX$$

$$\text{or} \quad \text{Log } P = A + b \text{ Log } P/W$$

The significance of b is tested by t-test. The value of t under the hypothesis that $\beta = 0$, the regression coefficient

of population from which the data are draw, is

$$t = b \sqrt{ (n-2) \Sigma (X-\bar{X})^2 \; / \; \Sigma (Y-\bar{Y})^2 }$$

1:3.8 Profits' trends, the absence of regularand continuous data, have not been studied. The data published by Reserve Bank of India((77)) is different for the three separate seri s, that is why a trend analysis is not possible.

1:4 LIMITATIONS OF DATA:

The data used in the analysis through out the study have been used with their original limitations. The main analysis is bas d on the Census of manufacturers, Annual survey of Industries, Indian Labour Statistics, Indian Labour Gazettee etc.,. Although data for Census of Manufacturers (1950-'58) and Annual Survey of Industries (1959-'64) are not strictly comparable, as the system of collection has been different, even then in the absence of other source, it may be used frequently.

Limitations and the explanations of the variables are given in the Appendices 'A' and 'B'.

OOOOOO

CHAPTER 2

CEMENT INDUSTRY

CHAPTER TWO

CEMENT INDUSTRY

2:1 INTRODUCTION:

The Manufacture of Portland Cement in India began in 1904 with the establishment of a Small Factory in Madras State. The venture was not successful and the project failed. During 1919 to 1924 several new factories came into existence and the ventures were successful due to the impetus provided by the First World War. But price-Competition developed among them, due to which on the recommendations of the Tariff Board (1925), Indian Cement Manufacturers Association(1925) and Indian Concrete Association(1927) were established. These two associations removed the competition and popularised the use of cement by giving free advice to consumers ((71,p.3;35,pp 276-278; 36, pp 533-537)). In order to minimise the internal competition, Cement Marketing Company of India (1930) and Associated Cement Companies Ltd., (1936) were established. Although the prices and supply of Cement were regulated,due to these associations,the Cement Industry faced again a crisis owing to cheaper price and competition with Dalmia Group's Cement Companies, but these two groups coilated in 1946, which ended the problems of this nature in the industry.

In 1948, Associated Cement Compnnies and Dalmia Groups again had a rift and they started selling separately. From 1947 to 1967 the industry's progress, number of workers employed etc., can be seen from Table No. One given below:

TABLE ONE

Year	No.of Factories Register-ed.	No.of days worked	Employ-ment	Employ-ment per Factory	Production (Lakh Tons)
1	2	3	4	5	6
1948	14	342	13492	963	15.52
1957	28	358	27358	975	56.01
1964	37	365	31623	855	94.00
1967	40	-	-	-	113.08

Source: Corresponding years Census of Manufacturers & Annual Survey of Industries Report, and Table 2:3

During the past fifteen years, covering the Plan period there has been a four-fold increase in Cement Production.Although this progress was satisfactory, there has been scarcity of Cement for a pretty long time.

Cement industry has to face several problems from many corners. Firstly, Cement Industry was under Government Control according to which (~~19~~ in 1942) 90% cement was purchased for defence and 10 percent for home consumption. Between 1946 to 1965, production, distribution and price of Cement Industry was controlled by Central Government of India. On 1st January '66 this control was released and partial demand regarding price-rise has been accepted. Though control has been released,

even then for the control of industry, it has to run under 'Cement Allocation and Co-ordinating Organisation' organised by the producers. Now the distribution of Cement is under 'Cement Trading Corporation' as given in the following Table

(In Percent)

GOVERNMENT	PLANNING BY CENTRAL GOVT.,	PLANNING BY STATE	HOME CONSUMPTION
1	2	3	4
50	10	10	30

Secondly, raw materials - lime stone, coal and Gypsum used ((27,pp 563-606))* in the production of Cement, are heavy in weight. They are scarcely available, Therefore the factories of the Cement Industry must be located in those places where all the three raw materials are available. Now, it is realized that better quality lime and Gypsum are lacking in the country.

Thirdly, lack of better quality of Coal, power, transport facilities and foreign exchanges have also hindered the progress of Cement Industry.

Fourthly, Cement Industry is a capital intensive industry and needs developed and most uptodate machineries which requires heavy capital and foreign exchange. In the absence of this,

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'*' "For the production of One Tone Cement, 1.6 tones lime 0.4 tone coal and 0.04 tone (Gypsom is used. Thus it is clear that the weight of Cement produced is half that of the weight of raw materials used".((27 pp.590-91))

the industry is most likely to suffer.

Fifthly, the price policy of the Government has much affected the Cement Industry. The price of cement has been lower than the Cost of Production, which has been pointed out by the President of Associated Cement Companies Ltd., Mr. D.M.Khatau ((35 pp.277; 72, pp 329)) in these words "The investment in the industry is about Rs. 118 Crores. Total employment in all the categories is 55,000. It pays Rs. 18 Crores yearly as production tax to Government. Total yearly consumption of Coal is 33 lakhs ton, which is 1/2 of all the coal digged in a year. It uses the 1/6 of total bags produced by Jute Industry. It pays Rs. 14 Crore as transportation cost to Indian Railways and produces Rs. 80 Crores yearly". Thus, if the Cement Industry, has to progress at all, it should be given a concession in the Coal price, railway freight and wages and Dearness Allowance. Price of the Cement should be increased to increase in the profit of the industry.

Sixthly, Cement Industry faces the problem of under utilization of its potentialities. Only 94 percent of total capacity of production is utilized.

Though Government is very cautious regarding the development of the Cement Industry, even then, unless old factories are given bounties, monopolicies are discourged and some investigation to reduce the cost of production, and increase in per capita Cement Consumption (18 Kgs per year) is made, it may not give the desired rate of Capital formation. The policy of decontrol has also been envisaged to fulfil these objectives.

2:2 EMPLOYMENT STRUCTURE:

Men, Women and Children are mostly found working in this industry both as workers and other than workers. Persons other than workers are employed in ex cutive positions and also as ministerial staff. Women and Children are generally employed as Greasmen, Gang-men, Sample Boys, Sweepers, Mazdoors (Reza), their respective percentage being 0.20, 100, 0.01, 0.2, 6.9, 14.8 of the total employment. (See, Table 2.1, 2:2 and 2:3).

According to the data present in occupational wage survey(1958-'59) entire working force in the industry was found employed in 92 occupations. As many as 44 occupations employed only 4% of the total employments and only 6 occupations accounted for about 59% of the workers. The 54 occupations selected for study in this report ((68,73)) employed over 96 percent of the total estimated employment in this industry.

As against 94.5 percent men employed in the industry the percentage of women workers was just 55 of the total. Women were mostly employed in three occupations viz., Helpers, Sweepresses and Mazdoors. There was no occupation in which women were exclusively employed.

2:3 WAGE STRUCTURE:

Cement Industry has a variety of occupations with a variety of pay scales, which are not homogeneous within the industry. Inter-state, occupational, geographical and sex wage differential are seen in this industry. Both, time-rated and Piece rated system of payment is found.

TABLE TWO

EMPLOYMENT STRUCTURE

Total Employment	Workers				Persons other than workers
	Men	Women	Children	Total	
2	3	4	5	6	7
16596	12739	1372	-	14388	2208
21627	13608	1478	-	1[illegible]858	[illegible]769
18216	11057	1000	-	15172	3044
1[illegible]025	11462	905	-	14940	3085
1[illegible]105	11622	632	-	15143	2962
20300	13306	861	-	17030	3270
26204	15310	1095	-	22240	3964
2733[illegible]	4422	1189	-	23199	4139
28534	17489	1210	-	23886	4648
25665	NA	NA	NA	19881	5784
28015	17938	731	-	22298	5717
28312	19185	748	-	23169	5143
28717	18800	768	-	23291	5426
29773	19804	802	-	24435	5338
31623	20812	846	-	25493	5730

Source : Table 2:2, and 2:3 '*' NA = Not available

Wage in the Cement Industry along with dearness allowance, bonus etc., shows important regional differentials, which are due to the ~~diff-~~ differences in the geographical environment, availability of local unskilled labour, and means of transportation etc., Regional differentials can be seen from the Table Three.

In 1953, it was Southern Zone, in which minimum basic wage range per month was (Rs. 16 to Rs. 40/-) highest of the order of Rs. 24/- ; Highest Dearness Allowance was given by Andhra Pradesh. Maximum average monthly basic wage of the male and female wage earners was Rs. 51/- and Rs. 39/- respectively given by the Southern Zone and Saurastra respectively, where as minimum average monthly basic wage for them was Rs. 12/- and Rs. 11/- paid in Andhra Pradesh. Owing to differences in levels of wages and cost of living prevailing at various Cemment Centres, the Central wage Board for Cement suggested two separate minimum wages for workers employed in Gujrat and Saurashtra regions and those employed in other states ~~statistical~~ (For details of minimum wage, Dearness Allowance etc., please see Table Five). The minimum wage prescribed by the Board consisted of basic wage, dearness allowance, house rent allowance and the value of amenities provided by the employers. The break-up for the two regions is indicated in TABLE FOUR.

TABLE THREE

[illegible]

(In Rs. PM)

State/ Centre	Minimum Basic wage	Minimum Dearness Allowance	Male Mazdoor basic wage	Female Mazdoor average basic wage
1.	2	3	4	5
Bihar	19-26	22-35	15-29	15-26
Bombay	26	26	27-33	-
Madras	23-25	31-38	23-25	12-22
Andhra Pradesh	15-26	36-46	12-30	11-28
Central-Zone	26	21-26	26-30	20-30
Saurastra	26-37	9-26	37-39	33-39
Southern-Zone	16-40	19-2	51	-
North-Western Zone	26-30	22-29	2[illegible]-31	24-26

Source: ((29, p.187, Table 57)).The above Table has been compiled from information contained in the reports of enquiries into the labour conditions in different industries conducted by the Labour Bureau, Govt.of India from time to time. Summaries of these reports have appeared in the various issues of the <u>Indian Labour Gazette</u>.

2) Figures have been rounded off to the nearest Rupee.

3) Mazdoor is Hindi equivalent for unskilled worker.

TABLE FOUR

Components of Minimum wage		REGIONS Gujrat & Saurashtra Regions	Rs.	Other Centres
1		2		3
1.	Basic	52.00		52.00
2.	Dearness Allowance	38.50		31.50
3.	House Rent -do-	7.50		7.50
4.	Value of Amenities provided by employer	3.00		3.00
	Total	101.00		94.0

After deducting from the above total Rs. 3/- which is the value of amenities provided by employers, the cash wage payable was fixed at Rs.98 for Gujrat and Saurashtra regions and Rs. 91 for other regions.

Dearness was linked with Consumer's Price Index of the country.

Besides minimum wage, the Board also prescribed differential wages for various categories of operatives in the Cement Industry, viz., (i) highly skilled, ii) skilled, (iii) Semi-skilled and (iv) unskilled. The monthly and daily wage scales prescribed for the corresponding four categories were as follows

TABLE FIVE

(In Rs.)

...gory of ...l	WAGE GRADES OF OPERATIVES	
	Monthly	Daily
...ly Skilled	110.50 - 6.50-169.00	4.25-0.25-6.50
...led Upper	83.20-5.20-124-80	3.20 - 0.20-4.80
...led lower	62.40-3.90-93.60	2.40-[illegible].15-3.60
Skilled	57.20-2.08-73.84	2.20-0.08-2.84
...illed	52.00 - 1.30 - 62.40	2.0[illegible]-0.05-2.40

Source: Hand book of Central Wage Board's Recommendations (Second Edition January 1968) pp 17-Chapter 3(Employers Federation of India) Bombay).

The daily wages were determined by dividing the minimum monthly wage by 26 days. The above grades recommended for the operative should also apply to peons, Watchman, motor drivers, bangalow servants, bearers, cooks, malis, sweepers, Ayahs, dressers, sanitary jamadars, Club Boys, ward boys, laboratory boys etc., employed by Companies along with other categories of employees taken by the Board.

Piece-rated operatives should be paid on the standard minimum worked load. They should not get less than the wage recommende for unskilled operatives in ~~the~~any case. They should also receiv the annual increments prescribed for unskilled operatives and these should be treated as basic wage not related to output.

The Board recommended standardized pay scales for the clerical, lower technical and supervisory staff under seven distinct grades. Grade I, the lowest, had a scale of Rs. 70-5-11 EB-5-150, and Grade VII, the highest, carried the scale of Rs.

Rs. 150-15-300-EB-20-460. Dearness allowance for the clerical and supervisory staff was also suggested by the Board.

The Board urged that women should be paid the same wage as men whereever they were employed on the same type of work. It also suggested that in applying the Board's recommendations, the existing differentials, which has been determined by custom, usage, local circumstances, experience in working over a number of years, awards and agreements should not be disturbed as far as possible.

The question of bonus was a matter of dispute among the members. It is now governed by the Bonus Act 1965. The recommendations of the Tripartite Industrial Committee on Cement for the abolition of contract labour in all operations connected with manufacturing process (including quarrying operations) except loading and unloading operations, should be given effect to within six month of the publication of the Report(i.e. from 1st January 1960).

The present wage structure and other informations can be given here on the basis of occupational wage survey 1958-'59 (Vide Table 2:1). The perentage of workers employed on the basis of piece-rated and time-rated are 8 and 92. Monthly, fortnightly, weekly and daily payments were made to 92%, 6% and 2% of the workers respectively.

Average daily minimum and maximum wages for all the occupations(in 1958-'59) were as 2.82 and Rs. 3.88 respectively. Average daily minimum wage rate varied from Rs. 2.30 in the case of mazdoors(unskilled workers) to Rs. 7.81 in the case of forema

TABLE SIX

WAGE STRUCTURE

Year	Wages Per Workers	Wages Per other than Worker	Money value of the benefit & previleges	Wage Bill as the percentage of value added
1	2	3	4	5
1950	907	1825	69	33
1951	925	1976	89	34
1952	1051	2210	90	30.7
1953	1211	2405	101	32.5
1954	1255	2522	130	27.3
1955	1108	2507	168	-
1956	1062	2598	183	35.5
1957	1142	2772	225	33.6
1958	1219	2808	222	40.9
1959	1293	2717	272	39.3
1960	1415	2790	244	48.5
1961	2413	3305	299	58.0
1962	2632	3745	355	33.0
1963	3180	3133	429	39.7
1964	2075	3971	409	47.6

Source : Table 2:3 and 2:2.

NB: i) Workers means who are directly employed to production site to do physical work.

ii) Other than workers means persons employed as clerk, admininistrative staff.

iii) Person include both workers and non-workers

iv) Money value of the benefits and privileges include House benefit, medical benefit etc..

Similarly maximum wage rates ranged in these two occupations from Rs. 2.73 to 17.46. Earnings of piece rated workers were greater than that of the time-rated workers.

Of all the 54 occupations 82 percent of the workers were found to be earning from Rs. 2.01 to Rs. 5.00, to 6.6 percent from Rs. 1.01 to Rs. 2.00 and the remaining 11.4 percent more than Rs. 5.00 per day.

Bonus, shift allowance, overtime is also found in this industry.

An analysis of the table six reveals that there has been a vast difference between the salaries of workers and other than workers (Appendix - Table 3:2). Yearly wage of the workers is just half of the wage of the other than worker. There has been a considerable change in the wage rates of the Cement Industry employees with effect from 1.1.'60 due to the recommendations of the first Central Wage Board.

A fluctuating percentage of the value added has been given to the persons employed in this industry in the form of wages and benefits (See Table 7) A significant change in percentage was seen in 1960 and 1961 (48.5 percent and 58 percent) as against the other years. It was due to the recommendations of the Central Wage Board ((68,73)).

In the preceding sections, we have seen the characteristics structure of employment and wages, recommendations of Central Wage Boards etc. , Now it will be interesting to study the relationship of wages and productivity, trends in wages and

and the effects of other internal and external forces statistically. Their validity is also to be tested. In this connection some statistical tools ~~like~~ like regression (Simple and multiple) exponential etc., have been frequently used in order to explain the reasons.

2:4 AVERAGE YEARLY EARNINGS - (1950-'64)

An attempt has been made to calculate average yearly earnings trends in regards to the employees of the Cement industry during 1950-'64.

We have preferred to fit a parabolic regression of second degree, because of the fact that the second difference of th dependent variable (Y , defined as

$$\Delta^2 Y_i = \Delta Y_i - \Delta Y_{(i-1)},$$

is almost merely constant, which is the condition for the beatfit line. This is shown in the following table:

TABLE SEVEN

Reference Table No.	Regression Used	REGRESSION Equation	Annual Rate	Residue
1	2	3	4	5
2:6	Parabolic	$Y = 4.204 + 0.29\ t + 0.018\ t^2$ (Vide figure 2:1)	4.534	3.26

Source: Table 2:6

Y stands for average yearly earnings in terms of money of the persons employed in the industry, t for time measured in years with reference to 1957 as origin. Hence, we conclude that ~~our~~ parabolic regression shown by the equation,

$$Y = 4.204 + 0.29\,t + 0.018\,t^2$$

represents the best fit line with a positive acceleration(i.e. 0.018) trend rate 0.29.

GOODNESS OF FIT TEST: ((38))

It is worthwhile to apply the chi-squared test (χ^2- test), which is a test of the agreement (or confirmity, or consistency) between a hypothetical and sample distribution Pearson's approximation, which is shown as

$$\chi^2 = \sum \frac{(n_i - np_i)^2}{np_i}$$

may be shown schematically as

$$\chi^2 = \sum \frac{(O_y - E_y)^2}{E_y}$$

where O_y is the observed and E_y is the expected frequency. It is clear that χ^2 may be considered as a measure of discrepancy between O_y and E_y. If there is no discrepancy, then $\chi^2 = 0$. Suppose our sample distribution agrees with the hypothetical (theoretical) distribution. In other words our null hypothesis is

$H_1 \quad : \quad O_y = E_y$

The value of χ^2 is given by

$\chi^2 = 0.544$ (Vide Table 2:6)

The 5 percent critical value of the $\chi^2 = 22.4$ corresponding t 13 degrees of freedom is greater then the computed value of $\chi^2 = 0.544$. The computed value of χ^2- does not lie between the rejection region that is $\chi^2 \geqslant 22.4$.

CONCLUSIONS:

(a) Hence for 5 percent level of significance χ^2 = 0.544 is not significant.

(b) So the fit is good and there is a great agreement between observed and theoretical value of earnings.

(c) In other words parabolic regression

$Y = 4.204 + 0.29t + 0.018t^2$

is best fit line to the data of table 2:6.

2:5.1 RELATIONSHIP BETWEEN YEARLY WAGE BILLS AND YEARLY VALUE ADDED.

It is interesting to study the total yearly wage payments in relation to the total production in money terms (Value added).

A linear regression of X (Wage Bills in ten thousand Rs.) on Y (Value added in ten thousand Rs.) is calculated by the help of least - squared method in Table 2:7 which can be seen from the following table.

TABLE EIGHT

Reference Table No.	Regression Used	Regression Equation	Annual Rate	Residue
1	2	3	4	5
2:7	Linear	X = 0.51Y -14.2	4.12	89.12

(Vide Fig. 2:2)

Source : Table 2:7

The linear regression equation represents the best fit, and the corresponding equation is

$$X = 0.51\,Y - 14.2$$

which explains X in the terms of Y. The co-efficient of regression is given by $b_{xy} = 0.51$.

It indicates that, during 1950-'64, the wages and salaries increases at an average rate of .51 per year.

The significance of b_{xy} is tested by t-test. The relevant value of t is given by,

$$t = (b_{xy} - \beta_{xy}) \sqrt{(n-2)\ \Sigma(Y-\overline{Y})^2 / \Sigma(X-\overline{X})^2}$$

Assuming $\beta_{xy} = 0$ and substituting the various values from table 2:7,

$$t = 0.51 \sqrt{13 \times 257.2 / 89.12}$$

$$= 0.51 \times 6.1$$

$$= 3.111 \text{ (Approximately)}$$

which is greater than the 5 percent critical value of $t = 1.771$ corresponding to 13 degrees of freedom. Hence, we reject the the nul hypothesis and our emperical regression co-efficient $b_{xy} = 0.51$, is significant. There is sufficient reason to accept that population exhibits a linear relationship between salaries and wages and value added, so the increase is not by chance.

2:5.2 A linear regression of Y (Value added in ten thousands Rs.) on X (Wage bills in ten thousands Rs.) is calculated by the help of least-squared method in Table 2:7, which can be seen from the following table:

TABLE EIGHT

Reference Table No.	Regression used	Regression Equation	Annual Rate	Residue
1	2	3	4	5
2:7	Linear	Y = 30.58+1.905X	12.17	257.20
	(Vide Figure 2:2)			

Source Table 2:7

The linear regression equation represents the best fit, and the corresponding equation is

$$Y = 30.58 + 1.905\ X$$

which explains Y in terms of X, Y being the value added and the coefficient of regression is given by $b_{yx}=1.905$.

It indicates that, during 1950-'64, the value added increases at an average rate of 1.905 per year.

The significance of b_{yx} is tested by the t - test. The relevant value of t is given by,

$$t = (b_{x\bar{x}} / \beta_{yx}) \sqrt{(n-2)\ \Sigma(X-\bar{X})^2 / \Sigma(Y-\bar{Y})^2}$$

Assuming $\beta_{yx} = 0$. and substituting the various values from table 2:7,

$$t = 1.905 \sqrt{13 \times 89.12\ /\ 257.2}$$

$$= 1.905 \times 2.1$$

$$= 4.0005 \text{ (approximately.)}$$

which is greater than the 5 percent critical value of t = 1.771 corresponding to 13 degrees of freedom. Hence, we reject the nul hypothesis and our empirical regression coefficient $b_{y\bar{x}} = 1.905$ is significant. These is sufficient reason that

population exhibits a linear relationship between salaries and wages and value added. So increase is not by chance.

2:6 CORRELATION BETWEEN WAGES OF WORKER AND VALUE ADDED:

An attempt has been made to calculate the Karl Pearson's correlation co-efficient between total value added (in Million Rs.) and Wages paid to the workers (in million Rs.) for a period of 15 years from 1950 to 1964, by the following formula:

$$r = \frac{(\Sigma xy) - n \ (\Sigma x/n) \ (\Sigma y/n)}{n\sqrt{\left\{(\Sigma x^2/n) - (\Sigma x/n)^2\right\} \left\{(\Sigma y^2/n) - (\Sigma y/n)^2\right\}}}$$

which on putting the value from table 2:5 gives the value of 'r' as follows :=

$$r = \frac{6.67 - (-7.5 /15) \ (2.5)}{15\sqrt{\left\{(38.41/15) - (7.5/15)^2\right\} \left\{(2.83/15) - (2.5/15\right.}}$$

$$= \quad 0.86 \quad \text{(Vide Table 2:5)}$$

It is worthwhile to test the significance of this correlation coefficient to strengthen our statement. This can be tested by the use of t-distribution or by nul hypothesis. Here we will use both t-distribution and sampling distribution of 'r'

SIGNIFICANCE OF CORRELATION COEFFICIENT 'r'

(i) By using t - distribution -

The value of t, under the hypothesis that the correlation co-efficient (ρ) in the population is zero, is given by

$$t = r \ / \sqrt{(1-r^2)/(n-2)}$$

which has a t-distribution with ϕ = n-2 degrees of freedom

Putting the various values from table 2:6, the value of 't' is given by

$$t = 0.86 / \sqrt{1-(0.86)^2 / 15-2}$$

$$= 5.925 \text{ (Approximately)}$$

which is greater than the 5 percent critical value of 't' = 1.7 for (n-2) of 13 degrees of freedom. The computed value of 't', therefore, does not lie in the "accepatnce area" of the 't' distribution and we are inclined to reject the hypothesis that ρ = 0. Hence correlation co-efficient 'r' = 0.86 is significant at 5 percent level.

Therefore, there is a strong correlation between total value added and wages paid to the workers. It is not merely by chance.

(ii) USE OF CORRELATION- COEFFICIENT TABLE:

When ρ = 0, we may find an exact sampling distribution of r, that is symmetric around 0 with a variance of,

$$\text{Variance (r)} = (1 - r^2) / \sqrt{(n-2)}$$

A characteristic of the sampling distribution of 'r' is that it depends only on ρ and n. Since we have assumed ρ = 0, it means that the sampling distribution for this case depends only on 'n'. Hence the probable values of 'r' will only depend upon the n.

Hence, the probable value of 'r' for ϕ = n-2(i.e.13) degrees of freedom (from Table) at 5 percent level of significance is 0.5139 which is less than the calculated value

of 'r', therefore, does not lie in the "acceptance area", that is $\rho\ (-0.5139 < r < 0.5139) = 0.95$, for the r-distribution and we are inclined to reject the hypothesis that $\rho = 0$. Hence correlation co-efficient $r = 0.86$ is significant at 5 percent level.

CONCLUSION:

Therefore, like t-test, the significance of 'r' is strongly supported by the use of r-tables. In other words, the correlation between value added and wages of the workers is significant and it is not merely by chance.

2:7 TOTAL AVERAGE YEARLY EARNINGS, CONSUMERS PRICE INDEX NUMBER AND PRODUCTIVITY : 1950-'64

A multiple linear regression of Y (Index Number of total average yearly earnings 1951 as base i.e. 2.9 = 100) an X_1 (Consumers price index number 1951 = 100) and X_2 (Value added per person i.e. productivity Index Number 1951 = 100) is calculated with the help of least-squared method in Table 2:8.

It comes out to be

$$Y = 1{\cdot}71X_1 + 0{\cdot}571X_2 - 1{\cdot}194$$

According to the regression equation, the total average yearly earnings (Y) decreased on an average of 0·571 thousands Rupees for each percentage of Consumers Price Index number (X_1), but increased on an average of 0.33 thousands Rupees for each percentage increase of Index Number of productivity (X_2). During the period of study, the productivity of the workers have been more effective in influencing the total yearly average earnings of the employees of cement industry

2:7 TOTAL AVERAGE YEARLY EARNINGS, CONSUMERS PRICE INDEX NUMBER AND PRODUCTIVITY: 1950-'64

A multiple linear regression of Y (Index Number of Total average yearly earnings 1951 as base i.e. 2.9 = 100) on X_1 Consumers Price Indedex Number base 1951 = 100) and X_2 (Value added per person i.e. productivity Index Number 1951 = 100) is calculated with the help of least squared method in Table 2:8.

It comes out to be:

$$Y = 1.71\ X_1 + 0.571\ X_2 - 1.124$$

According to the regression equation, the total average yearly earnings (Y) increased on an average of 1.71 thousands Rupees for each percentage of Consumers Price Index Number (X_1). but increase one an average of 0.571 thousands Rupees for each percentage increase of Index Number of productivity(X_2). During the period of study, the productivity of the workers have been more effective in influencing the total yearly average earnings of the employees of Cement industry as compared to the Consumers Price Index Number. The partial regression Co-efficient $b_{y1.2}$, and $b_{y2.1}$ are respectively given by

+ 0.171, and + 0.571.

Their significance is tested by the use of 't' test

SIGNIFICANCE OF $b_{y1.2}$:

The value of the t-test is given by

$$t = (b_{y1.2} - \beta_{y1.2}) \times \sqrt{(n-k-1) \sum (X_1 - \bar{X}_1)^2 / \sum (Y - \bar{Y})^2}$$

where, $\beta_{y1.2}$ is the corresponding partial regression co-efficient in the population from which the regression data have been drawn. We shall test the hypothesis that a change in X_1 in the population does not produce any change in yearly earning of the employees. This makes $\beta_{y1.2} = 0$. Therefore, the value of t is given by

$$t = b_{y1.2} \sqrt{(n-k-1) \sum (X_1 - \bar{X}_1)^2 / \sum (Y_1 - \bar{Y})^2}$$

where n = total number of observations,

K = number of co-efficients to be determined.

n - k- = = the number of degrees of freedom.

putting the various values from table 2:8 the value of t is given by

$$t = 1.71 \sqrt{(14-2-1) \times 0.32 / 2.86}$$

$$= 1.71 \times 1.1$$

$$= 1.881 \text{ (Approximately)}$$

which is greater than the 5 percent critical value of 't' = 1.796 for (n-k-1) or (14-3) or 11 degrees of freedom. The computed value of t, therefore does not lie in the 'acceptance area" of the t-distribution, and we are bound to reject the hypothesis that $\beta_{y1.2} = 0$. The change in the average yearly earnings of the employees of the cement industry as a result of unit change in Consumers Price Index Number, shown by the

regression equation is thus not only due to sampling.

SIGNIFICANCE OF $b_{y2.1}$

The value of t, under the hypothesis that corresponding partial regression co-efficient $\beta_{y2.1}$ in the population is zero, is given by,

$$t = b_{y2.1} \sqrt{(n-k-1) \quad \sum (X_{21} - \bar{X}_2)^2 / \sum (Y-\bar{Y})^2}$$

where n and k have their usual meanings.

Putting the ~~vatious~~ various values from Table 2:8 the value of t is given by,

$$t = 0.571 \sqrt{11 \times 1.06 \;/\; 2.86}$$

$$= 0.571 \times 2.8$$

$$= 1.\text{[illegible]} \text{ Approximately}$$

which is greater than 5 percent critical value of $t = 1.796$ for (n-2-1) or 11 degrees of freedom. The computed value of 't' therefore, doesnot lie in the 'acceptance area" of the t-distribution, and we are bound to reject the nul hypothesis that is $\beta_{y2.1} = 0$. The change in average yearly earnings of the employees of Cement Industry, as a result of unit change in the productivity indices, shown by regression equation is thus not only due to sampling.

CO-EFFICIENT OF MULTIPLE CORRELATION $R_{y.12}$

The co-efficient of multiple correlation between the average yearly earnings of the employees of Cement Industry (Y) on the one hand and Consumers Price Index Numbers (X_1) and productivity indices (X_2) on the other, are found to study the combined importance of the latter to the former.

It is given by,

$$R^2_{y.12} \quad = \quad \Sigma(Y' - \bar{Y})^2 \;/\; \Sigma(Y - \bar{Y})^2$$

where, Y' is the calculated value of corresponding X_1 and X_2.

Putting the values from Table 2:8, the value of $R^2_{y.12}$ is given by,

$$R^2_{y.12} \quad = \quad 1.68 \;/\; 2.86$$

$$= \quad 0.5874 \quad \text{(Approximately)},$$

The square of the multiple correlation coefficient (also known as the co-efficient of determination) ((33; 38; pages392-410)) indicates that about 58.74 percent of the variation in the average yearly earnings of the employees of Cement Industry (Y) is determined by the Consumers' Price Index Number (X_1) and productivity indices (X_2). The remaining 41.26 of the variation in Y remains unexplained and is determine by certain other factors like, size of establishment, technology trade union,personal capacity of management, etc., and also some other factors not taken into account here.

SIGNIFICANCE OF $R_{y.12}$

In order to verify if this conclusion is also true about the population from which the regresssion data are drawn the significance of $R_{y.12}$ is tested by the help of F-test.

The relevant value of F of F-test is given by:

$$F = \frac{\text{Variance explained by the Regression Equation}}{\text{Residual Variance}}$$

for k, and n-k-1, degrees of freedom, where k, is the number of

variables eliminated. The hypothesis being tested is that $\rho_{y.12} = 0$, where $\rho_{y.12}$ is the coefficient of multiple correlation in the population.

The following table gives the familiar break-up summary of variance.

TABLE NINE

ANALYSIS OF VARIANCE SUMMARY FOR THE OBSERVED REGRESSION DATA

Sources of variation	Sum of Squares	Degrees of Freedom	Mean Square
1	2	3	4
Total	$\Sigma(Y-\bar{Y})^2$ $= 2.36$	$(n-1) = 13$	$\Sigma(Y'-\bar{Y})^2/k$ $= 1.68/2$ $= 0.84$
Linear Regression	$\Sigma(Y'-\bar{Y})^2$ $= 1.68$	$k = 2$	
Residuals from Regression	$\Sigma(Y-Y')^2$ $= 2.28$	$(n-k-1) = 11$	$\Sigma(Y-Y')^2/(n-k-1)$ $= 0.207$

Source : Table 2:8

Therefore, the value of F of F-test is given by

$$F = 0.84 \; / \; 0.207$$

$$= 4.058 \text{ (Approximately)}$$

which is greater than 5 per cent critical value of F = 3.98 corresponding to 2, and 11 degrees of freedoms. The F-ratio is highly significant. The computed ~~of~~ value of F = 4.058 does not lies in the non-critical region of the F- distribution, and therefore, the hypothesis that $\rho_{y.12} = 0$ is rejected. Our conclusion about $R_{y.12}$ is, therefore, not only due to chance only.

(Contd.)

2:8 SIZE OF ESTABLISHMENT, PRODUCTIVE CAPITAL, WAGES AND PRODUCTIVITY:

Generally, it is believed that productive capital requirements per head increases with the increase in the size of the establishment. But it bears a reciprocal relationship in the case of cement industry, that is productive capital requirement per head decreases as the size of establishment is increased. For evidence (Table 2:10), that there has been a decline of 3? percent (approximately) in the requirement of productive capital from the establishment group (100-249) to the group of (2000-4999). Total productive Capital requirements are Rs. 42,680/-, Rs.24,130/- Rs. 24,130/- and Rs. 20,850/- in the group of men employing (250-499), (500-999), (1000-1999) and (2000-4999) respectively.

Let us now consider the trend of labour productivity. It is clear from the table 2:9 that labour productivity increases with the size of establishment, rate of increase being small. Since there were no establishments in the smaller groups, productivity of labour seems to be affected(Increased).

Let us see how far this statement is true statistically. A linear regression has been fitted to the data of table 2:9. This is shown in the Table No. 10.

'TABLE TEN'

Reference Table	Regression used	Regression Equation *	Rate of change of according to size of Estb. '+'	Residue
1.	2	3	4	5
2:9 2:10	Linear	Y = 2.02 X-0.132 (Vide Fig. 2:3)	6.5	160.84

Source Table 2:9, 2:10 '*' X = Log P/W, Y =Log P

'+' It is obtained by = Y/n, where n = no.of establishments
Hence it is = 32.62 /5 = 6.5.

Linear regression shown by the equation.

$$\text{Log } P = 2.02 \text{ Log } P/W - 0.132$$

represents the line of best-fit.

It is worthwhile to apply the t-test to test the significance of b- the least squared regression co-efficient as obtained by the best fit regression equation. Suppose β is the hypothetical population regression co-efficient. By assuming $\beta = 0$, we may test the hypothesis that, in the population, the regression co-efficient is zero. This means that there is no relationship between log P and Log. P/W (i.e. Y and X) in the population.

The value of t of the t-test is given by

$$t = (b - \beta) \sqrt{(n-2) \; \Sigma (X-\bar{X})^2 / \; \Sigma (Y-\bar{Y})^2}$$

The quantity t follows the so called t-distribution with (n-2) degrees of freedom (n being number of observations). The number of degrees of freedom is two less than the number of observations, because two constants (a and b) have been eliminated from the date.

Therefore, the value of t is given by

$$t = + 2.02 \sqrt{(5-2) \times 32.62 \; / \; 160.84}$$

$$= + 2.02 \times 0.9$$

$$= 1.818$$

which is greater than the 10 percent critical value of t = 1.638 corresponding to 3 degrees of freedom. Hence, we reject the nul-hypothesis, and our empirical regression co-efficient

b = 2.02) is significant. It is concluded from this that there is a linear relationship between Log P and Log P/W The t-test, thus, strengthens our conclusion that production depends upon productivity of the labour, too. It is not only due to the effect of technological production.

2:2 PROFITS:

It will now be interesting to examine the trends of the profits in Cement Industry. Inspite of several difficulties in the case of measurement of the profit, a picture of profit and losses can be had from the "FINANCIAL STATISTICS OF JOINT STOCK COMPANIES 1950-'51 to 1962-'63" Prepared by Reserve Bank of India, Due to the variations in the number of companies, the profit statistics for the whole period is studied in three separate series covering ; (1) 1950-'51, to 1955-'56, (2) 1955-'56 to 1960-'61 and (3) 1960-'61 to 1962-'63 for a period of 15 years(respectively for 7,12, and 15 companies) ((Table 5:2.11, No.of Companies Table)).

(i) Profit Before Tax:

Profit before tax shows an increasing tendency the periods 1950-'51 to 1955-'56 and 1960-'61 to 1962-'63 and a declining tendency in the period 1955-'56 to 1960-'61, (Vide Table 2:11 statement 5.1)

(ii) PROFIT AFTER TAX:

From the table 2:11 statement 5:1 it is seen that the trend in profit after tax in all the three periods under study is increasing. There has been continuous rise in the periods 1950-'51 to 1955-'56 and 1960-'61

to 1962-'63 from Rs. 197 lakhs to Rs. 2[illegible] lakqhs and Rs. 409 lakhs to Rs. 553 lakhs. So far as the second period of study is concerned, it has decreased to Rs. 244 lakhs in 1959-'60 from Rs. 359 lakhs in 1955-'56 and then has risen upward to Rs. 387 lakhs in 1960-'61.

(iii) **PROFITS AS PERCENTAGE OF NET WORTH:** It follows the same pattern of the profit before tax. It has rising tendency in the periods 1950-'51 to 1955-'56 and 1960-'61 to 1962-'63 and a decline in the period 1955-'56 to 1960-'61.

2:10 PROFITS AND WAGES:

Though profits data are not sufficiently available to explain the behaviour of wages, even then it will be logical to suppose that any rise in profits may increase the wages of the workers. A balancesheet approach to analyze the profitability ratio of the Cement Industry shows that bonus shares (Rs. 2.11 Crores) ((72, Table I, pp. 28-29)) has been constant from 1959 to 1964, whereas total paid-up capital has increased from Rs. 34.87 to Rs. 41.41 Crores.

Salaries, Wages and Welfare expenses ((72, Table II, pp.30,31)) have shown a rise from Rs. 8.24 to Rs. 12.23 Crores from 1960 to 1964. Profit before tax, Net profit after tax, profit retained has also increased. Some profitability ratios which determine the capacity to pay are given below:

a) the ratio of Gross profits to sales,

b) the ratio of gross profits to total capital employed, and

c) the ratio of profit after tax to net worth. While the first ratio indicates the rate at which the industry in making profit on sales, the second one shows the gross return on the total capital employed in the business regardless of the source of the Capital and the Third measures the profitability of the share-holders equity in the business represented by the paid up capital and reserves and surplus. As the last ratio indicates the rate of profit after meeting all expenses and external liabilities, it is considered to be most appropriate index of profitability. This is the ultimate measure of success of the industry and this rate should be adequate considering the nature of the industry and the investment risks it entails ((72, Table EIGHT, pp 387,389))

The ratio of gross profit after depreciation to sale showed a rise 13.8 percent in 1960 and 1961 to 16.9 percent in 1962 and then declined steadly to 16% in 1963 and 15.4 percent in 1964. Gross profit to total capital exmployed too registered a marked increased of 12 percent in 1962. The ratio dropped to 10.7 percent in 1963 and remained at that level in 1964. The ratio of net profit after tax to net worth which is most important test of profitability from the shareholder's point of view, stood at 7.7 percent in 1960 and improved marginally to 7.8 percent in 1961. This was 9.5 percent in 1962 and 9.9 percent in 1963 and 9 percent in 1964.

[illegible] [illegible]:

The performance of the industry during 1965 revealed substantial improvement in all respects. Expense ratio has dropped in the latest year showing a higher profit margin. Significant increases in the gross and net profits have resulted in the improvement of the profitability ratios. The ratio of net profit to net worth registered sizeble increases from 9 percent to 11.3 percent. Dividends paid on equity shares showed a rise from 10.7 percent to 11.2 percent. Out of 15 companies, 11 companies paid dividends at 10 percent or more. Profits retained also recorded substantial increase. But, however, barring statutory reserves, other reserves and surplus retained in the business declined from Rs. 0.22 Crores to Rs. 0.05 Crore. The share of net worth in total libilities dropped from 51.1 percent to 49.8 percent revealing increased dependence on outside sources of funds. Reserves as a percentage of networth remained almost at the same level of 33 percent. There has been no appreciable change in the inventory levels. Current ratios shows a satisfactory liquidity position in the first and ~~ee~~ Third series/ which is approximately 2.1 and 1.2.

2:11 CONCLUSIONS:

From the above statistical study it is concluded that:

(a) there is a strong correlation between total value added and wages paid to the workers. In other words, production very much depends on the conditions of labour, which is determined by the wages paid to them and Cost of living

(b) total earnings of the employees in the period 1950 to 1964 follows:

a parabolic path given by

$$Y = 4.204 + 0.29\ t + 0.18\ t^2$$

which has an average trend of 0.29 (yearly) and a positive acceleration of the order of 0.18.

The error is cyclical, which may be due to the payment of arrears, bonuses and interium relief recommended by the First Cement Wage Board((71))

(Vide Fig. 2:1, Table 2:6)

(c) like (first conclusion), total wage bills(Vide section 2:6) bears a linear relationship with value added. Its trend value is positive which infers that not only wages of the workers, but total earnings (wages Plus Salaries Plus money value of benefits and previliges) of the employees of the Cement Industry explain the value added to the industry.

(d) the multiple correlation co-efficient is not significant. Hence, considered together the consumers Price Index and per capita output (i.e. productivity) do not satisfactorily explain the total average earnings of the employees of Cement Industry. However, neither Consumers Price Index after eliminating the effect of productivity ($b_{y1.2}$) nor productivity after eliminating the effect of Consumer Price Index ($b_{y2.1}$) satisfactorily explains total yearly average wage rate. (Vide Section 2:7).

(e) the production is explained by the productivity and increases with the size of establishment. The rate of change is 2.02

Apart from the above conclusions wage differentials (inter-state,)Geographical, Sex, Occupational) etc. are seen being narrowed with the passage of time. The first Cement Wage Board ((72)) has caused much influence on the total earnings of the Cement workers, because it has considered (i) industry's capacity to pay and needs of the industry, (ii) special features of the industry, (iii) statutory and non-statutory benefits, (iv) prevailing Rates of Wages, (v) Requirements of social justice and the (vi) impact of trade - unionism in the evolving Wage structure of the Industry. This Board has recommended a scheme of Wage-gradation enforced in the Associated Cement Companies Limited and thus altered the existing differentials. The Cement Board favoured the narrowing down of existing differentials in the following words: ((1))

"Not only is it sound in principle to narrow down differentials, but it is also necessary from the point of view of not putting more burden on the industry than is necessary. At the same time we have not overlooked the fact that there is a considerable shortage of skilled workers, and the process of narrowing down cannot be carried so far that it may serve as a disincentive to the acquisition of skill"

Occupational wage differentials has widened in the case of Board's recommendations(20.0 percent) as compared to the occupational Wage Survey(1[illegible].3 percent) (1

The Cement Board has ((1,p 72)) differentiated wages regionwise by prescribing for Gujrat and Saurashtra one wage and for the regions outside this, another wage rates.On the the basis of weightage of the Cost of Living. But it is seen that even within one region there have existed differentials in wages of the same worker.

Cement Wage Board has recommended indentical wages to men and women, because it was seen that productivity of both sexes is same((1, p.74;2). Cement Wage Board has not made any recommendations to link wage with results.

Regional differentials in this case also due to the surplus labour, skillness and productivity of labour (though Cement Industry is not an individual process working Industry), and demand of labour.

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CHAPTER 3

COTTON TEXTILE INDUSTRY

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COTTON TEXTILE INDUSTRY

3:1 INTRODUCTION:

Indian Cotton Textile Industry holds the third place amongst the Cotton Cloth producing countries in the world, next only to China and America. ((52,69)). Its rank is second in the World Cotton Textile Trade. It is a major industry in the country supplying one of the basic requirements of the people. Inspite of the rapid growth of other industries, the cotton textile industry still continues to be one of the important industries in the country from the point of view of capital employed, turnover and number of people employed((69))

The Cotton Textile Industry developed in the Nineteenth Century due to the extension of Railways and opening of the Suez Canal, which reduced the transportation cost of the imported machinary etc.,. The growth of the industry in the Twentieth Century can be largely attributed to the growth of spirit of nationalism and the struggle for political independence and economic self-reliance and the consequent boycott of British goods. The national movement no doubt placed emphasis on Khadi, neverthless the Indian Cotton Textile Industry (specially handloom) was also benefitted by it.

The rapidly growing, Cotton Textile Industry was adversely affected* ((69)) by the Second World War. In the immediate post war period, the textile industry was prosperous, but

'*' There was complete elimination of the imports of spare parts of machines and equipments, due to which priceshad gone up ((69)).

rehabilitation and modernization had assumed considerable importance and urgency.

The most distinguishing feature of the period --1947 to 1965 with regard to the Cotton textile industry was that Handloom Industry was offered protection by the Government.

Another development during the past twenty years has been the expansion of the cotton textile industry to geographical areas where it did not exist in the past on account of the policy of decentralization and regional development follows by the Government the industry has expanded particularly in Andhra Pradesh and Kerala States.

During the past 15 years, a number of Committees appointed by the Government of India reviewed the problems of the Cotton Textile Industry. The working group(appointed in 1950) remarked, "the industry is working with plant and machinery most of which is not only old but completely outmoded and renewal of machinery is an urgent problem of the industry".((69)) Commenting on this the Working Group for the cotton textile industry observed in 1960, "the present position of the industry h s worsened still further"((69, P.6)). Similar views on the need of modernization, rehabilitation and rationalisation have been expressed by the Textile Enquiry Committees in 1954 and in 1958 and also by the First Central Wage Board ((81)) for the Cotton Textile Industry. The Handloom Industry was the subject of a working group in 1959 and Powerloom Enquiry Committee submitted its report in 1964.

The cotton Textile Industry had to face many serious

problems during 1947 to 1965. After Partition, most of the cotton mills remained in India, while 30 percent cotton producing area went to Pakistan. This resulted in the shortage of cotton and posed a serious problem for the cotton Textile Industry. The Cotton shortage has been covered through imports and increased production.

Secondly, the handloom industry was given more importance. An excise duty was levied on mill made cloth and a rebate given on hand loom cloth from co-operatives in order to encourage the consumption of handloom fabrics. The development of powerloom has also affected the industry.

Thirdly, due to the old methods of production, old and outmoded machines, and lack of automatic machines, several factories are running at a loss. Labour and machine productivity of these factories are low and the cost of production is high.

Meanwhile there has been a change in the propensity of the consumers who now prefer mill made fine fabrics to course, handloom fabrics. As a result, the mills producing course cloth and have also been adversely affected and the purchasing power of the workers of such factories has been reduced. Lastly the Cotton Textile Industry, depends, to a considerable degree, on the monsoon controls and restrictions, imposed by the government.

An important fact worth mentioning is that the co-operative sector in textile mill industry is gradually coming up. There were 63 co-operative spinning mills with a total capacity of over 1200,000 spindles. They are a source of supply of

yarn to the handloom industry. All possible encouragement has been given for the establishment of new co-operative mills.

3:2 EMPLOYMENT STRUCTURE:

Like other textile industries men, women and children constitute the total working force in both mill and handloom sectors of the Cotton Textile Industry. The Industry runs in three shifts of eight hours each. ((24)). It employed about 2,345 persons daily in 1950. Number of workers in the Cotton Textile Industry has remained more or less stationary during the past ten years. There has been a slight increase among men workers and there has been a drop in the number of Women Workers. With the present position and future prospects of the Cotton Textile Industry it is doubtful if the employment potential can be expanded very greatly. In the first place, there is need to increase productivity of the machines as well as the workers. Secondly, there is no expectations of expansion of the industry.

3:3 WAGE STRUCTURE:

The existing wage structure in the Cotton Textile industry has been envolved after the second world war. Prior to 1940 wages were the result of negotiations between employees and trade unions on the recommendations of the Court of Enquiries. After 1940, the profits of the industry increased substantially and cost of living rose very steeply . There was a demand for increase in Wages. A Dearness Allowance was introduced by employers. The employers of Cotton Textile Factories in Ahmedabad paid Dearness Allowance linking it with Consumers'

IPLOYMENT-STRUCTURE TABLE ONE

No.of Factories Register-ed	Factories Giving Returns	Employ-ment per Factory	WORKERS PER FACTORY Men	Women	Children
2	3	4	5	6	7
608	567	1061	965	91.6	0.38
830	492	1248	11 58	103.5	0.30
491	468	1383	1273	109.1	0.19
482	460	1436	1309	107.3	0.08
521	488	1388	1266	108.5	0.07
530	508	1399	1237	106.9	-
553	512	1499	1300	105.4	0.08
567	511	1389	1413	131.0	NA
615	509	1159	1108	91.0	0.71
526	514	1464	NA	NA	NA
528	510	1441	1294	90.2	0.08
538	529	1523	1368	89.08	0.05
558	558	1420	1251	79.09	0.02
583	566	1324	1201	77.2	-
635	609	1276	1151	72.3	-

Source : Table 3:2 and 3:3

Price Index Number.

Similarly, in and after 1946 several Tribunals were appointed, which were asked to recommend on wages and working conditions. These tribunals fixed wages and Dearness Allowance linked with Consumers Price Index Number after considering the"minimum dietary requirements" the size of the family and the conditions of works etc.,

There was, however, considerable variation in Dearness Allowance between the various states because of variation in the cost of living index as well as the degree of neutralization of the increased cost of production. The first Central Wage Board for Cotton Textile Industry in its report in 1959,((81 9) recommended a flat increase of Rs. 8/- for 'A' Category Mills and Rs. 6/- for 'B' Category Mills from 1st June 1960, and further flat increase of Rs. 2/- from 1st Jan. 1962 over the then existing basic wages. Dearness Allowance was also increased in certain regions to ensure greater neutralization of the Cost of living. The Second Wage Board had been set up at the end of the year 1964. ((82)). It has not yet concluded its deliberations.

However the total wages paid in centres other than Bombay, Ahmedabad and Madras are still low. The following table gives the wages and dearness allowance paid in different countries for the years 1961-'66, which can be seen from the Table Two.

TABLE TWO

DEARNESS ALLOWANCE PAID T TEXTILE LABOUR IN IMPORTANT CENTRES (For a standard month of 26 working days)

(In Rs.

s	Minimum Basic Wages	MONTHLY AVERAGE 1961	1962	1963	1964	1965	1966
	2	3	4	5	6	7	8
	40.00	91.7[illegible]	93.40	96.08	114.79	127.08	143.62
bad	38.00	86.95	83.52	85.15	103.44	125.40	138.80
ur	34.00	66.59	73.02	72.82	92.23	96.33	113.82
	36.	78.25	78.9[illegible]	76.63	92.30	113.31	124.92
	38.00	63.65	65.67	66.98	76.45	88.78	101.35
	32.00	64.01	64.77	67.36	80.72	101.6[illegible]	102.72
	40.[illegible]	75.85	79.09	83.05	96.68	115.14	125.30
	38:00	59.94	65.43	66.69	86.36	101.92	106.54
engal	36.17	35.79	44.01	50.53	55.38	60.81	70.03

Source: Indian Cotton Textile Industry 1966-- Annual Statistical Bulletin issued by the Southern India Millowners' Association, Coimbatore.

A new problem has cropped up for the Wage Boards in regard to the incentive wages. Considering the majority of the piece-rated workers in the industry the employers have recognised the Annual Bonus as the labour's right in profits.

3:3.1 OCCUPATIONAL WAGE SURVEYS FINDINGS (Vide Table 3:1)

From an analysis of the figures given in Occupational Wage Survey 1958-'59((68, 73)), it is clear that over 4/5 of the total employment (1,80,747) in the industry was found to be paid monthly, and little less than one seventh fortnightly and in the remaining either weekly or daily.

Most of the workers' were permanent. The proportion of temporary workers was, however, found to be quite substantial (21 percent). The system of appointing Badli or substitute workers was found in all the strata except Kanpur, Banglore, Madras Madurai and Ramnathanpuram. The system of appointing apprentices was found in Coimbotore, Calcutta and Howarah, Delhi and remaining centres. Casual workers were also appointed ~~and~~ in Howrah and Calcutta.

Both the average minimum and maximum wage rates were in highest in Bombay and Bombay Suburbs. The average maximum wage was slightly higher in Delhi, than it was in Ahmedabad, but the average minimum wage rate was considerably lower in Delhi. Both these rates were lowest in Bangalore. In the case of selected occupations also both, the average minimum and maximum wage rates were found in Bombay and Bombay Suburbs and Ahmedabad and lowest in Bangalore.

Dearness allowance linked with Consumers Price Index Number was paid to the workers of Bombay and Bombay Suburb, Sholapur, Nagpur, Indore, Ahmedabad, Delhi and Coimbatore. It was paid at a flat rate in Howrah and Calcutta, Jaipur, Ajmer etc., In the case of residual stratum about 30 percent of the workers were paid dearness allowance according to the income group.

The average per capita daily earning in this industry was Rs. 3.94. The average daily earnings were highest --Rs.5.26 in Bombay and Bombay Suburbs. The average daily earnings were lowest in Bangalore -- Rs. 1.94.

The highest average daily earnings were noticed in the case of the occupations like Head Jobber, Jobber, Line Levelling Fitter and Four Sider. The lowest earnings were noticed in the case of the occupations like Bale-Breaker, Tenter Weighter, Single Sidar and Reeler. Earnings of men and women in the same occupation were found to be more or less the same. Earnings of the piece - rated workers mere generally found to be higher than the time rated workers in the same occupations.

Overtime work was not, generally speaking, resorted to, in this industry. Incentive/Production Bonus Schemes were not found to be widely prevalent in this industry. A similar kind of study on Cotton Textile Industry has been conducted by National Council of Applied Economic Research, New Delhi((10)), which evolves ranking system.

3:3.2: Total earnings of the employees of Cotton Textile Industry have risen more in the Survey period (ie 1959-65) than those in the census period (i.e. 1950-'58).than

TABLE THREE

WAGE STRUCTURE AND PRODUCTIVITY IN COTTON TEXTILE INDUSTRY IN 1 9 5 0 - '64

tal rnings r ployee s.'000)	Wages Per Worker (Rs. '000)	Wages per other than workers (Rs. '000)	Money Value of benefit or Privileges (Rs.'000)	Output per factory (in Cr.Rs.)	Value Added per person (Rs. 000)	Wages* (Total) as % Value added	Productive Capital per Worker	Rat of Pro cti Cap to Fac val of put
	3	4	5	6	7	8	9.	10
40	1.11	1.82	.069.7	10.51	5.30	33.0	9.86	1.0
81	1.22	1.97	.087.4	10.32	3.34	34.0	11.09	1.0
10	1.28	2.21	.090	1[illegible].58	4.44	30.7	13.92	0.8
10	1.33	2.40	.101	12.52	4.66	32.5	15.86	1.0
95	1.29	2.52	.130	13.61	5.76	27.3	16.58	0.9
90	1.24	2.50	.168	12.96	5.46	-	20.26	1.2
73	1.30	2.59	.183	12.96	4.17	35.5	21.00	1.4
28	1.36	2.77	.225	13.37	4.17	38.56	23.40	1.4
27	1.37	2.80	.222	13.85	4.16	40.9	27.92	1.6
53	1.43	2.71	.272	NA	4.79	39.3	27.11	1.2
01	1.60	2.97	.2444	17.98	4.73	48.5	25.08	1.0
59	1.67	3.30	.299	19.34	5.27	58.0	27.45	0.98
35	1.89	3.78	.355	21.22	6.49	33.0	28.21	0.90
43	1.97	3.81	.429	21.86	6.28	39.7	29.53	0.91
61	2.03	3.97	.409	23.12	5.99	47.6	30.2	0.90

Source: Table 3:2, 3:3

The ratio of the total earnings of workers and other than workers was 1:1.5 in 1950, which has increased to 1:1.9 in 1964. Money value of benefits or privileges has risen more than 6 times that of in the period 1950 to 1964. It may be due to the several recommendations for the betterment of workers labour conciousness and organization etc.,

The labour's share as total wage bill of the value added has also increased from 35% to 47.6% between the period 1950 to 1964. It is clear from this that importance of labour is being appreciated day by day. Government's interference and development of trade union organizations may be said to be the root cause of this.

A sudden jump in the earnings of the employees in 1960 from 1959 may be attributed to the flat increase of Rs.8/- or Rs. 6/- recommended by First Central Wage Board. ((81)). ~~To~~

To study the trend in the rise in Wages and earnings a time series analysis, will be found in the following sections. It is clear from a glance at the table that straight line trend may be best fit to the data. So straight line and parabolic trend have been fitted to reduce the error, But here only parabolic trend has been fitted because error in straightline-fit was high.

3:4 AVERAGE YEARLY EARNINGS(1950-'64)

An attempt has been made to calculate average yearly earning's trend in regard to the employees of the Cotton Textile Industry during 1950-1964.

It has been preferred to fit a parabolic regression of

second degree, because of the fact that the second difference of the dependant variable (Y), defined as

$$Y_i = Y_i - Y_{i-1} ,$$

is almost constant, and satisfies the conditions for the line of best-fit. This is shown in the following table:

Reference Table No.	Regression Used	Regression Equation	Annual Rate	Residue
1	2	3	4	5
3:6 (Vide Fig., 3:1)	Parabolic	$Y = 4.528 + 0.213\ t_2 - 0.006\ t^2$	4.6	2.08

Source : Table 3:6

Y stands for average yearly earnings in terms of money of the persons employed in the industry, t for time, measured in years with reference to 1957 as origin. Hence, we conclude that our parabolic regression shown by the equation

$$Y = 4.528 + 0.213\ t - 0.006\ t^2$$

represents the best fit line with a positive acceleration (i.e. - 0.006) and a positive trend rate of equal to 0.213 yearly.

<u>GOODNESS OF FIT-TEST:</u> ((33)), ((38, p.617))

It is thought proper to apply the Chi-squared that test (i.e. χ^2- test), which is a test of the agreement (or confirmity, or consistency) between a theoretical (hypothetical) and sample distribution. Karl Pearson's approximation, which is shown as,

$$\chi^2 = \sum \left[\frac{(n_i - np_i)^2}{np_i} \right]$$

may be schematically as

$$\chi^2 = \sum \frac{(O_y - E_y)^2}{E_y}$$

Where, O_y is the observed and E_y is the expected frequency. As it is clear , this χ^2 may be consider d as a measure of discrepancy between O_y and E_y. If there is no discrepancy, then $\chi^2 = 0$, Suppose our sample distribution agrees with the hypothetical (theoretical) distribution. In other words, our null - hypothesis is

$$H_1 \;:\; O_y = E_y$$

The value of χ^2 of the χ^2-test is given by

$\chi^2 = 0.435$ (Vide Table 3:6)

The 5 percent critical value of the $\chi^2 = 22.4$ corresponding to 13 degrees of freedom is greater than the computed value of $\chi^2 = 0.435$. The computed value of χ^2 does not lie between the 'rejection region' that is, $\chi^2 \geqslant 22.4$.

CONCLUSIONS:

(a) Hence for 5 percent level of significance our $\chi^2 = 0.435$, is not significant.

(b) So our fit- is good and there is a great agreement between observed and theoritical value of earnings of the employees of Cotton Textile Industry

(c) In other words, our parabolic regression

$Y = 4.520 + 0.213\ t - 0.006\ t^2$

is best fit line to the data of table 3:6

After seeing the Fig. 3:1, it is clear that error is Cyclicals which may have arisen due to some internal factors, which may have been out of our study.

3:5.1 RELATIONSHIP BETWEEN YEARLY WAGE BILLS AND YEARLY VALUE ADDED:

It is interesting now to study statistically the total yearly wage payments in relation to the value added.

A linear regression of X (Total Wage Bills) on Y (Value added is calculated by the help of least-squared method in Table 3:7 which can be seen from the following table

TABLE FIVE

Reference Table No.	Regression Used	Regression Equation	Annual Rate	Residue
1.	2.	3	4	5
3:7	Linear	X = 0.108 + 0.71 Y	12.5	193.66

(Vide Fig. 3:2)

Source Table 3:7

The linear regression equation represents the best-fit, and the corresponding equation is

$$X = 0.108 + 0.71\ Y$$

which explains X ~~internal~~ ms of Y, X being the total Wage bills and Y the value added. The co-efficient of regression of X on Y is given by $b_{xy} = 0.71$.

It indicates that, during 1950-1964, the total wage bills increases at an average rate of 0.71 per year.

The significance of b_{xy} is tested by the t-test. The relevant value of t - is given by,

$$t = (b_{xy} - \beta_{xy}) \sqrt{(n-2) \quad (Y - \bar{Y})^2 / (X-\bar{X})^2}$$

Assuming $\beta_{xy} = 0$ and substituting the various values from Table 3.7,

$$t = 0.71 \sqrt{13 \times 362.83 / 193.66}$$
$$= 0.71 \times 4.9$$
$$= 3.479 \quad \text{(Approximately)}$$

which is greater than 5 percent critical value of t = 1.771, corresponding to 13 degrees of freedom. Hence, we reject the null hypothesis i.e. $_{xy}= 0$, and our empirical regression co-efficient $b_{xy} = 0.71$ is significant. There is sufficient reason to believe that population exhibits a linear relationship between salaries and wages and value added. So, it is concluded that, increase in total wage bill is not merely due to chance, but by the increase in value added.

3:5.2 REGRESSION OF Y (VALUE ADDED) ON X (WAGES, SALARIES AND OTHER BENEFITS):

It is interesting to study the total yearly wage payments in relation of the total production in money terms (value added).

A linear regression of Y (Value added in ten thousands Rs.) on X (wage Bills in Ten Thousands Rs.) is calculated by the help of least-squared method in Table 3:7, which can be seen from the following table:

TABLE SIX

Reference Table No.	Regression Used	Regression Equation	Annual Rate	Residue
1	2	3	4	5
3:7	Linear	$Y = 1.11 + 1.31\ X$	17.5	362.83

(Vide Figure 3:2)

Source : Table 3:7

The linear regression equation represents the best fit, and the corresponding equation is

$$Y = 1.11 + 1.31\ X$$

which explains Y in terms of X, Y being the value added and the co-efficient of regression is given by $b_{yx}=1.31$.

It indicates that, during 1950-1964, the value added increases at an average rate of 1.31 per year

The significance of b_{yx} is tested by the t-test. The relevant value of t is given by

$$t = (b_{yx} - \beta_{yx}) \sqrt{(n-2)\ (X-\bar{X})^2 / (Y-\bar{Y})^2}$$

Assuming $\beta_{yx} = 0$ and substituting the various values from Table 3:7

$$t = 1.31 \sqrt{13 \times 193.66 / 362.83}$$

$$= 1.31 \times 2.6$$

$$= 3.404 \text{ (Approximately)}$$

which is greater than the 5 percent critical value of t = 1.771 corresponding to 13 degrees of freedom. Hence, we reject the nul - hyposthesis and our empirical regression co-efficient b = 1.31 is significant. There is sufficient reason to

belive that population exhibits a linear relationship between salaries and wages and value added. So increase in value added is not merely by chance, but by due to affect of wages and salaries.

3:6 CORRELATION BETWEEN WAGES OF WORKERS AND VALUE ADDED:

An attempt has been made to calculate the Karl Pearson's Correlation Co-efficient between Total value added (in M.Rs.) and wages paid to the workers (in M.Rs.) for a period of 15 years from 1950 to 1964 by the following formula.

$$r = \frac{\Sigma(xy) - n\left(\Sigma x/n\right)\left(\Sigma y/n\right)}{n\sqrt{\left\{(\Sigma x^2/n) - (\Sigma x/n)^2\right\}\left\{(\Sigma y^2/n) - (\Sigma y/n)^2\right\}}}$$

On substitution the corresponding values from Table 2:5, the value of r is given by

$$r = \frac{173.69 - (5.1)\left(-6.8/15\right)}{15\sqrt{\left\{(102.73/15) - (5.1/15)^2\right\}\left\{337.08/15 - (-6.8/15)^2\right\}}}$$

$= 0.95$ (Vide Table 2.5)

It is worthwhile to test the significance of this correlation coefficient to strengthen our statement. This can be tested by the use of t-distribution or by nul-hypothesis. Here we will use both t-distribution test and sampling distribution test for r.

SIGNIFICANCE OF CORRELATION COEFFICIENT 'R' - 'r'

(i) By using t - distribution -

The value of t, under the hypothesis that the correlatic co-efficient (ρ) in the population is zero, is given by

$$t = r \,/ \sqrt{(1 - r^2)/(n - 2)}$$

which has a t-distribution with $\phi =$ n-2 degrees of freedom.

Putting the various values from table 2:6, the value of 't' is given by

$$t = 0.95 \sqrt{(1-(.95)^2 \;/\; 15-2}$$

$$= 10.8 \text{ (Approximately)}$$

which is greater than the 5 percent critical value of t = 1.771 for (n-2) or 13 degrees of freedom. The computed value of t, therefore does not lie in the "acceptance area" of the t-distribution and we are inclined to reject the hypothesis that $\rho = 0$. Hence, correlation co-eeicient 'r' = 0.95 is significant at 5 percent level.

Therefore, there is a strong correlation between total value added and the wages paid to the workers. ((See Appendix - Limitations of Census of Manufacturers and Annual Survey of Industries)). It is not merely by chance.

ii) USE OF CORRELATION COEFFICIENT TABLE -

When $\rho = 0$, we may find an exact sampling distributing of 'r' that is symmetric around (0) zero with a variance of

$$\text{Variance } (r) = (1 - r^2) \,/ \sqrt{(n-2)}$$

A characteristic of the sampling distribution of 'r' is that it depends only on ρ and n. Since we have assumed $\rho = o$, it means that the sampling distribution for this case depends only on 'n'. Hence the probable values of 'r' will only depend upon the 'n'.

The probable value of 'r' for $\phi =$ n-2 (or = 13) degrees of freedom (from table) at 5 percent level of significance is 0.5139 which is less than the calculated value of r. The computed value of 'r' therefore, does not lie in the "acceptance area", that is

$P(-0.5139 < r < 0.5139) = 0.95$, of the 'r'

distribution and we are bound to reject the hypothesis that $\rho = 0$. Hence, correlation coefficient r = 0.95 is significant at 5 percent leve.

Correlation coefficient 'r' is also calculated by the use of formula $r = \sqrt{b_{yx} \times b_{xy}}$,

which comes to be $r = \sqrt{1.31 \times 0.71} = \sqrt{0.9301} = 0.95$,

which also proves the correctness of regression lines and the relationship between the dependent and ~~independents~~ independent variables.

CONCLUSION:

Therefore, like t - test, the significance of r is strongly supported by the use of r-tables. In other words, the correlation between value added and wages of the workers in the industry is significant and it is not merely by sampling or chance.

3:7 TOTAL AVERAGE YEARLY EARNINGS, CONSUMER PRICE INDEX NUMBER AND PRODUCTIVITY (1951-1964)

A multiple linear regression of Y (Index Number of Total

average yearly earnings, 1951 as base year) on X_1 (Consumers Price Index Number, 1951 as base year) and X_2 (Value added per person i.e. (productivity Index Number, 1951 as base) is calculated by the help of least - squared method in Table 3:8.

It comes out to be

$$Y = -0.24 + 0.39\ X_1 + 1.01\ X_2$$

According to the regression equation, the average yearly earnings(Y) increased on an average of 0.39 thousands Rs. for each percentage of Consumers Price Index Number (X_1) but increased fastly by an average of 1.01 thousands Rs. for each percentage increase of Index Number of Productivity(X_2). During the period of study, the productivity of the workers has been more effective in influencing the total yearly average earnings of the employees of cotton Textile Industry as compared to the Consumers Price Index Number. The partial regression co-efficient $b_{y1.2}$, and $b_{y2.1}$ are respectively given by 0.39 and 1.01. Their significance is tested by the use of t-test.

SIGNIFICANCE OF $b_{y1.2}$

The value of t-test is given by

$$t = (b_{y1.2} - \beta_{y1.2}) \sqrt{(n-k-1) \quad (X_1 - \bar{X}_1)^2 / \quad (Y-\bar{Y})^2}$$

where $\beta_{y1.2}$ is the corresponding partial regression co-efficie[nt] in the population from which the regression data have been drawn. We shall test the hypothesis that a change in X_1 in the populatio[n] does not produce any change in yearly earnings of the employees.

This m kes $\beta_{y1.2} = 0$. Therefore, the value of t is given by,

$$t = b_{y1.2} \sqrt{(n-k-1)\ \Sigma(X_1-\bar{X}_1)^2 / \Sigma(Y-\bar{Y})^2}$$

where, n = total number of observations,

K = number of coefficients to be determined,

(n-k-1) = the number of degree of freedom.

Putting the various values from Table 3:8, the value of t is given by,

$$t = 0.39 \times \sqrt{11 \times 0.32 / 0.97}$$
$$= 0.39 \times 1.9$$
$$= 0.741$$

which is less than the 5 percent critical value of t = 1.796 for (n-k-1) or (14-3) or 11 degrees of freedom. The computed value of t, therefore, lies in the "accetpance area" of the t-distribution and we are inclined to accept the hypothesis that $\beta_{y1.2}=0$. The change in the average yearly earnings of the employees of the Cotton Textile Industry as a result of unit change in Consumers Price Index Number, shown by the regression equation is thus due to sampling or chance only.

SIGNIFICANCE OF $b_{y2.1}$

The value of t, under the hypothesis that corresponding partial regression co-efficient $\beta_{y2.1}$ in the population is zero is given by

$$t = b_{y2.1} \sqrt{(n-k-1)\ \Sigma(X_2-\bar{X}_2)^2 / \Sigma(Y-\bar{Y})^2}$$

where n and k have their usual meanings.

Putting the various values from Table 3:8, the value of t is given by

$$t = 1.01 \sqrt{11 \times 0.93 / 0.97}$$
$$= 1.01 \times 3.25$$
$$= 3.2825 \text{ (Approximately)}$$

which is greater than 5 percent critical value of t = 1.796 for (n-2-1) or 11 degrees of freedom. The computed value of t therefore, does not lie in the "acceptance area" of the t - distribution and we are inclined to reject the null hypothesis i.e. $\beta_{y2.1} = 0$. So, our regression co-efficient $b_{y2.1} = 1.01$ is significant. The change in average yearly earnings of the employees of the Cotton Textile Industry, as a result of unit change in the productivity indices, shown by regression equation is not due to chance of sampling only.

CO-EFFICIENT OF MULTIPLE CORRELATION $R_{y.12}$

The co-efficient of multiple correlation between the average yearly earnings of the employees of Cotton Textile Industry (Y) on the one hand and Consumers Price Index Number (X_1) and productivity index number (X_2) on the other, is found to study the combined importance of the latter to the former.

It is given by

$$R^2_{y.12} = \sum_{1}^{14} (Y' - \bar{Y})^2 \Big/ \sum_{1}^{14} (Y - \bar{Y})^2$$

where, Y' is the calculated value of the corresponding X_1 and X_2.

Putting the various values from Table 3:8 the value of $R^2_{y.12}$ is given by

$$R^2_{y.12} = 0.89 / 97$$

$$= 0.917 \text{ (Approximately)}$$

The square of the multiple correlation co-efficient (also known as the co-efficient of determination ((33,38, 37))) indicates that about 92% of the variation in the average yearly earnings of the employees of Cotton Textile Industry (Y) is determined by the consumpers Price Index Number (X_1) and productivity index Number (X_2). The remaining 8% of the variation in Y remains unexplained and is determined by certain other factors like, size of establishment, technology, trade Union and administrative wastages which have not been acco nted here.

SIGNIFICANCE OF $R^2_{y.12}$

In order to verify if this conclusion is also trye about the population from which the regression ~~on~~ data are ~~ared~~ drawn, the significance of $R_{y.12}$ is tested by the help of F-test. The relevant value of F of F-test is given by.

$$F = \frac{\text{Variance explained by the regression Equation}}{\text{Residual Variance}}$$

for K, and (n-k-1) degrees of freedom, when k, is the number of variables eliminated. The hypothesis being tested is that $\rho_{y.12} = 0$, where $\rho_{y.12}$ is the coefficient of multiple correlation in the population.

The following table gives the familiar break - up summary of variance:

TABLE SEVEN

ANALYSIS OF VARIANCE SUMMARY FOR THE OBSERVED REGRESSION DATA

Source of Variance	Sum of Squares	Degree of Freedom	Mean Square
1.	2	3	4
Total	$\sum_{=1}^{14}(Y - \bar{Y})^2$ $= 0.97$	$(n - 1) = 13$	$\sum_{=1}^{14}(Y' - \bar{Y})^2 / k$ $= 0.89 / 2$ $= 0.445$
Linear Regression	$\sum_{=1}^{14}(Y' - \bar{Y})^2$ $= 0.89$	$k = 2$	
Residuals from Regression	$\sum_{=1}^{14}(Y - Y')^2$ $= 0.25$	$(n-k-1) = 11$	$\sum_{=1}^{14}(Y - Y')^2/(n-k-1)$ $= 0.022$

Source = Table 3:8

Therefore, the value of F of F-test is given by,

$$F = 0.445 / 0.022$$

$$= 20.22 \text{ (Approximately)}$$

which is greater than 5 percent critical value of $F=3.98$ corresponding to 2, and 11 degrees of freedom. The F-ratio is highly significant. The computed value of $F=20.22$ lies in the "rejection region", of the F-distribution. The hypothesis $\rho_{y.12} = 0$

fore, rejected.

This means that in the population, the variance in the total average yearly earnings (Y) is accounted for by linear regression on Consumers Price Index Number (X_1) and the productivity index number (X_2). The conclusion about $R_{y.12}$ is, therefore, strenthened and is not due to chance.

3:8 SIZE OF ESTABLISHMENT, PRODUCTIVE CAPITAL, WAGES & PRODUCTIVITY:

Cotton Textile industry, as we have seen in the introduction of this chapter is composed of Handloom, Spinning and Weaving. Its productivity is affected by its equipment pattern, which is more complex than any other industry studied here.

Though Gross productivity in small units is higher than in larger units, but net productivity forms an opposite trend and it is lower in small units than in larger units.((39,40 It is because of the fact that,

i) the smaller units are mainly spinning mills while larger units are generally of composite nature.

ii) spinning mills are more capital-intensive than composite mills; and

iii) the ratio of the net value added to gross product is lower in spinning mills as compared with composite mills.

In the census of manufacturers' classification of factories, the smaller size groups contain mainly spinning mills, while composite mills predominate in the larger-size groups. The ratio of net value added to the gross product is less in spinning mills as compared to the composite mills. This ratio, i.e. net product as a ratio to gross products, increases as the size of the unit increases in both of these sub-sets. This unmistakably proves that the cost per unit of output decreases as the size of the units increases.((39)), ((40,)), ((16,PP.110-135)).

This is due to the, i) more effective integration in relativel larger sized firms, resulting in economies in overhead costs, ii) easier availabi ity of credit facilities, and iii) better management and supervision. It is due to this reason that the product per unit of labour increas s with the size of the factories.

The reasons of this decrease in capital intensity may be held as following:

i) that the spinning mills are more capital intensiv and they dominate in the smaller - size groups;

ii) the under-utiliz tion of capital in the spinning mills is more as compared to the larger composite mills,

iii) the capital intensity in the smaller units is higher, because the spinning section of the mill is proportionately larger in size as compared to the weaving sections.

The above mentioned statements may be very well verified statistically, which can be seen from the table given below:

TABLE EIGHT

RANK CORRELATION COEFFICIENTS

Year	Size and Technology	Size and Productivity	Technology & Productivity
1	2	3	4
1953	- 0.83	0.98	- 0.87
1954	- 0.73	0.98	- 0.43
1955	- 0.57	1.00	- 0.60
1956	- 0.63	0.92	- 0.70
1957	- 0.82	0.98	- 0.78
1958	- 0.52	0.93	- 0.63

Source: Economic and Political Weekly, Vol.IV, No.44, Nov.1, 1969 pp 1742-45 .

Now to verify a relationship that labour productivity and wages in regards to the size of the establishments, an attempt has been made to calculate a linear logarithmic regression of Production (value added) (Y) on productivity(defined as P/W = X where W is the number of Workers), by the method of least-squared in table 3:9.

The summary of the analysis table is given as below:

TABLE NINE

Reference Table	Regression Used	Regression Equation *	+Rate of change according to size of Establishment	Residue
1.	2	3	4	5
3:9	Linear Logarithmic	Y = 1.817X +0.0243	6.3	146.2
3:10				
	(Vide Fig. 3:3)			

Source - Table 3.9, 3.10

'*' Y = Log P, X = Log P/W

'+' Rate of Change = ΣY / n, where n = No.of establishments.

Hence it is = 55.93 / 9 = 6.3 (Approximat

Linear regression shown by the equation Log P = 1.817

Log P = 1.817 Log P/W + 0.0243

represents the best fit.

It is worthwhile to apply the t-test to test the significance of b-the least-squared regression co-efficient as obtain by the best fit regression equation. Suppose β is the hypothetical, population regression co-efficient. By supposing $\beta = 0$,

coefficient is zero. This means that there is no relationship between log P and Log P/W. (i.e. Y & X) in the population.

The value of t of t-test is given by

$$t = (b - \beta) \sqrt{(n-2) \quad \Sigma(X - \bar{X})^2 / \Sigma(Y - \bar{Y})^2}$$

The quantity t follows the so-called t-distribution with (n - 2) degrees of freedom (n being the number of observations). The number of degrees of freedom is two less than the number of observation because two constants(a and b) have been eliminated from the data.

Therefore, the value of t is given by

$$t = 1.817 \sqrt{(9 - 2) \ (29.98) / 146.20}$$

$$= 1.817 \times 1.2$$

$$= 2.1756 = 2.176 \text{ (Approximately)}$$

which is greater than the 5 percent critical value of t = 1.89 corresponding to seven degrees of freedom. Hence,we reject the nul - hypothesis, and our empirical regression co-efficient (b=1.87) is significant. It is concluded,therefore, from this that there is a linear relationship between Log P and Log P/W. The t-test thus strengthens our conclusion .

3:9 PROFITS:

The only authoritative study available on the present subject in India for the period 1916 to 1930, was that of Dr. P.S.Lokanathan ((22)). Thereafter, it was Dr. M.M.Mehta ((23-A,PP 3 to 50)) quoted from ((24))), who made a simila attempt to study the subject of profitability,in relation to productivity in Cotton Textile Industry ...

1929 to 1942.

The present study extends beyond the limits covered by the two aforesaid studies. It is for a period of 15 years extending from 1950 to 1964. It will now be interesting to examine the trends in money wages in the context of the corresponding trends in Industrial profits. For a clear idea of the profits trend it is thought proper to make the study u several heads like, profits before and after tax, profit after tax as percentage of net worth ((which is a measure of capacit to pay of the industry) etc., The present study is based on the study of balance-sheets of 750 or more number of joint stock companies in India, published by Reserve Bank of India((77)) The entire period from 1950 to 1963 has been studied in three parts, (i) 1950-'51 to 1955-'56 (2) 1955-'56 to 1960-'61 and (3) 1960 - '61 to 1962-'63. The reason is that the profits data available for these periods are for varying numbers of companies, viz. 145, 211 and 262 respectively (Vide Table 5.2, No.of factories studied in the three series'table) Since they are not strictly comparable the statistical trends for the entire period of study cannot possibly be discovered.

Generally, there has been a lack of association betwe wages and profits which may be explained by two sets of circums tances ((29)). Firstly, there is always a time-lag between the emergence of profit in any particular year and the payment of profit sharing bonus as a result of negotiations between unions and managements which follow only in the next year and also the time taken by the industrial courts and Tribunals to give their bonus award. This means that a rise in money wag

in that year but to profits made in the earlier years. Besides, the official index of profits in any one year relates to the results of working in the previous year.

The second set of circumstances is the rise in money wages due to a rise in working class cost of living index. Now, it may happen that a movement of money wages resulting from the first set of circumstance may either be off-set or accentuated by a contrary or a similar movement in the other set of circumstances.

3:9.1 PROFITS BEFORE TAX Vide Table (5:3.11)

It is clear that profit before tax in the case of Cotton Textile industry has risen from Rs. 1365 lakhs to 2014 lakhs in the period of 1950-'51 to 1955-'56, With Rs. 2,271 lakhs and Rs. 643 lakhs as maximum and minimum in the years 1951-'52 and 1952-'53 respectively.

In the period 1955-'56 to 1960-'61, the trend of profit may be a parabolic (on inspection). The maximum and minimum profits being Rs. 3666 lakhs and Rs. 434 lakhs in 1960-'61 and 1957-'58 respectively. In the third period of analysis profit trend is of decreasing nature.

3:9.2 PROFITS AFTER TAX

Profit after tax also forms the same trend as the profit before tax. It is maximum Rs. 1263 lakhs and minimum Rs. 294 lakhs in 1955-'56 and 1952-'53, respectively. Similarly it was maximum Rs. 2379 lakhs and minimum Rs.-(Rs.192) lakhs in 1960-'61 and 1957-'58 respectively. It has decreased from Rs. 2956 lakhs to Rs. 1467 lakhs forming a declining trend in the period 1960-'61 to 1962-'63 (Vide table 5.3:11. Statement 5.2).

3:9.3 PROFITS AFTER TAX AS PERCENTAGE OF NET WORTH

Like above two studies in profit this also follows the same trend. The highest and lowest percentage 8.6 and 2.1 goes to 1955-'56 and 1952-'53 in the first series, 13.3 and -1.2 to 1960-'61 and 1957-'58 in second series, and 13.5 and 5.0 in 1960-'61 and 1962-'63, in the third series of the study.

3:10 CONCLUSIONS:

On the basis of the above study following inferences can be drawn -

(a) there is a strong correlation between total value added and wages paid to the workers. In other words production in cottontextile industry much more depends on the wages paid to the workers(Vide section 3.6).

(b) the total earnings of the employees in the period 1950 to 1964 follows a parabolic trend given by

$$Y \doteq 4.528 + 0.213t + 0.006\, t^2$$

which has an average trend of 0.213(yearly) and an ~~negative~~ acceleration of the order of 0.006. The error (Vide Figure %:1, Table $:6) is cyclical, which may be caused due to the payments of arears, bonuses, interim-relieves, recommended by first Wage Board on Cotton Textile Industry.

(c) Total wage bills bear a linear relationship with value added. Its trend value is positive. So It is infered that not only wag s of the workers, but total earnings(wages + Salari s + money value of benefits and previliges) of the employees

of the Cotton Textile Industry explains the value added of the industry (vide section 3:5.1, 3:5.2).

d) the multiple correlation co-efficient is highly significant. Hence considered together the consumers price index and value added per person (ie productivity) satisfactorily explain total earnings of the employees of cotton textile Industry.

However, after dlimination productivity($b_{y1.2}$), Consumer Price Index Number does not explain the total earnings satisfactorily; where as, if we do not consider the effect of Consumer Price Index($b_{y2.1}$) the productivity satisfactorily explains the total earnings(Vide Section 3:7).

(e) the linear logarithmic equation also supports the abo e conclusion that productivity bears a positive correlationship with productivity as size of establishment increases. The rate of change is 0.0243. (Vide Section 3:8).

(f) Apart from the above inferences, it will not be out of place to present comparative findings of the occupational wage Survey (1958-'59) and Cotton Textile Wage Boards. ((68, 73)) and ((81, 82)).

From the study of "National Council of Applied Economic Research" entitled ' Wage differentials in Indian Industries" pp 51-52), ((10)) we find an alarming change in the rank of wage paying c ntres. It is clear that "the rate of growth in per capital earnings has been much higher generally in the low wage areas than the high wage areas for both these categories of

employees. " ((10)).

In the case of wage differentials, Cotton Board favoured the present skill wage differentials and "granted a flat increase in the existing wages of manual employees and expected that the wages of the rest of the employees would be automatically adjusted; it thus left the existing differentials undisturbed". ((1)). The Board favoured the (a) skilled and occupational, (b) region / area, (c) size of unit and (d) sex and age differentials.

In evolving the wage structure, the Cotton Textile Board gave proper weightage to work load (as suggested by Fair Wage Committee) in these words — " The Board realized the, —— and the Board has inevitably reached the conclusion that for the good of the industry, of labour and of the consumer, certain desirably minimum standards in work loads should be achieved through out the industry as soon as possible"((1)). Not only this, but payment by piece rate was also not opposed. ((1)).

Wage structure suggested by the Wage Board depends upon the (1) industry's capacity to pay and needs of industry, (2) characteristics of the industry, (3) statutory and non-statutory benefits, (4) prevailing rates of wages and (5) requirements of social justice with the impact of trade unionism.

The monthly total minimum wage comprising basic wage and dearness allowances recommended by the Board in manufacturing Section varied from Rs. 66 pm to Rs. 120 p.m.

3:11 WAGES, PROFIT AND PRODUCTIVITY:

From Fig. 3:3 if is obvious that total earnings and profits after tax bears a positive correlationship. Wages may be explained in terms of profits also. The average rise in money wages has been significantly greater than that in profits. So, far as the Cotton Textile Industry is concerned, the period from 1952 to 1954 is seen to have been the most difficult period.

When compared with other textile producing countries, the productivity of the Indian Cotton Textile industry is very low. The causes of low productivity in India can be summed up as follows:

The cotton textile industry, which has always been considered a labour intensive industry and a means of employing large numbers of people; has now been turned into capital intensive industry, due to technological developments. The change has not taken place in India.

The machinery and equipment used in India are still of Conventional type and their rate of productions is 30 to 40% lower than in other textile producing countries. The standards of ~~makin~~ maintenance and working conditions in some of the mills are such that a large increase in productivity would be difficult to achieve without an improvement in these condition. Similarly shortage of Cotton, foreign exchanges etc., are also major causes of low productivity in Cotton Textile Industry in India.

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CHAPTER 4

WOOLLEN TEXTILE INDUSTRY

CHAPTER FOUR

WOOLLEN TEXTILE INDUSTRY

4:1 INTRODUCTION:

The Indian Woollen Industry is a part of the textile group of industries. The first woollen mill was established as early as 1870, primarily to meet the requirements of the defence forces of the country. In the subsequent years a few other units came into being. The woollen industry progressed after the First World War. There were four woollen mills in 1941. As a result of the great demand for the woollen goods after the first world war, private enterprises were stimulated to start new mills and between 1919 and 1921((9)) three new mills in the neighbourhood of Bombay were started. At the same time woollen mills sprang up also in Bangalore, Baroda, and Amritsar. Owing to foreign competition, the industry was in a depressed condition. Between the years 1925-33 three of the mills went into liquidation. Indigenous industry was granted protection by the Govt. of India in 1934.

The major units of the industry are at Kanpur, Dhariwal (Punjab), Bombay and Mysore. In 1939 there were 24 woollen mills in India, employing 17, 201 person. In addition, there were 19 woollen carpet and shawl weaving establishments and 73 hosiery factories employing 3382 and 264 persons respectively.

The following table shows the locates of the woollen mills in 1939 ((9)).

TABLE ONE
LOCATION OF WOOLLEN MILLS
IN 1939

Province of State and District	No.of Factories	No.of Workers
1	2	3
Uttar Pradesh:		
Kanpur	2	2311
Mirzapur	1	51
Total	3	2362
Punjab-Gurdaspur(Dhariwal)	1	1960
Amritsar	5	701
Total	6	2661
Bengal - Dacca	1	161
Bombay - Island	3	1025
Thana	1	759
Total	4	1784
Madras - Becary	1	52
Bihar - Bhagalpur	1	413
Mysore - Bangalore	1	64
Kashmir- Shrinagar	3	9277
Baroda	1	332
Rajputana	3	95
Grand Total of India (Excluding Burma)	24	17201
British India	16	7433
Indian States	8	9768

Source: ((9))

The annual production of raw wool in undivided India was about 86 millions lbs., a year. After the partition production of raw wool in India was estimated 60 million lbs., Production capacity of the woollen mills in India was 30 million labs a year. The actual position of production from 1946 to 1949 is given in the following Table Two.

TABLE TWO

PRODUCTION OF WOOLLEN MANUFACTURERS IN INDIA

Year	1946	1947	1948	1949
Production (Mill.,) (lbs)	27.0	24.0	23.6	20.1

Source: Vakil, C.N. — "Economic Consequences of Divided India".

The division of the country has adversely affected the woollen textile industry. It was only in the period 1957 to 1961 that the industry reached its present strength and position.

There were 94 units in(1964) in the organisdd Sector of the Industry concentrated mostly in Punjab, Haryana and Maharastra. In the decentralized sector there are thousands of small units concentrated in Punjab and Haryana, organised on a domestic basis, and they are highly labour intensive. The relationship between the organised and the decentralised sectors is one of complimentarity because the decentralized units depend up n the organised units for the supply of their essential raw material namely, yarn.

4:2 Employment Structure:

Like Cotton textile industry, men, women and children are found employed in the woollen industry also. From the Table Three, it is clear, that child employment is being discouraged since 1950. The ratio between women and men workers in the woollen textile industry is 1:15.

4:2.1 It would be better to present a brief sketch of employment on the basis of Occupational wage Survey 1958-'59((Vide Table 4:12).

There were 142 occupations in the industry of which the occupations in which at least 50 persons were employed, numbered 56, which accounted for 92 percent of the total employment in the industry. Out of these 56 occupations, 46 were found in Bombay and Bombay Suburbs, which accounted for 94 percent of the total number of workers employed and the rest in other centres.

In Bombay and Bombay Suburbs and Amritsar, the occupation Mazdoors and Powerloom Weavers constitute a great percentage of the total employment.

Women workers constituted 19% of the total employment in Bombay, about 4 percent in Amritsar, and 3 percent in residual stratum. ((73)). For the Industry as a whole women were about 7 pe cent of the total employment.

There were 21 selected occupations in which both, men and women were employed. Men were exclusively employed in 34 percent of the selected occupations and women in only one. Most of the workers were permanent. The percentage of temporary workers varied from 16 to 23. Badali, workers constitute 26 percent of the total employment in Bombay and Bombay Suburbs. Casual and apprentices were also found employed in this industry.

4:3.1 WAGE STRUCTURE (Vide Table Four)

The over all average daily minimum and maximum wage rates for all occupations taken together were Rs. 2.91 and Rs. 4.06 respectively, in the industry as a whole. The corresponding figures for the three strata-Bombay and Bombay Suburbs, Amritsar and Residual are Rs. 4.00 and Rs. 4.71, Rs. 2.37 and Rs. 3.78 and Rs. 2.51 and Rs. 3.81 respectively. In general, wages were

highest in Bombay and Bombay Suburbs and lowest in Amritsar.

Dearness allowance was paid to a number of employees as a separate component of wage, except in Amritsar, where it was not paid separately. In almost all the cases it is linked with Consumer Price Index Number.

The average per capita earnings of all the workers in industry taken together were Rs. 3.47 daily. It was highest Rs. 4.27 in Bombay and lowest Rs. 2.07 in Amritsar. 95 percent of the workers of the total employment were being paid Rs.3.29 daily. The disparity in earnings was much lower in Bombay and Bombay- Suburbs than ~~the~~ in Amritsar.

Both, time - rated and piece - rated systems of wage payment were seen in this industry. Earnings of piece-rated workers were higher than those of the time-rated workers.

The practice of working overtime was not widely prevalent. The hourly overtime earnings were Rs. 1.00 in the Residual strutum, Rs. 0.69 in Bombay and Bombay Suburbs and Rs. 0.36 in Amritsar.

Only in Bombay and Bombay-Suburbs and Residual Centres excepting Amritsar 6 percent to 8 percent workers were benefitted by incentive-Bonuses shift-allowances etc.,

4.3.1 From Table Three it is obvious, that the wages of the Workers have increased two times from 1950 to 1964. It is clear that earnings of the ministerial and administrative staff are higher than those of the workers. The wages and salaries as a percentage of value added have increased from 33 to 47.6 (from 1950 to 1964)

TABLE THREE
EMPLOYMENT STRUCTURE

No.of Factories giving return	Employment per Factory	Total Employed.	Men Per Factory	Women per Factory	Child per Factory	Wage per Worker	Wage per person	Wage other than Worker	Wages & Salaries as percentage of value added.
2	3	4	5	6	7	8	9	10	11
43	13492	316	295	20	0.7	~~205~~	920	25	2542 33
43	14386	300	269	19	0.6	1106	27	2760	34
45	15801	353	289	21	0.2	1052	36	2912	30.7
49	16778	336	283	21	0.3	1083	53	2930	32.5
59	16471	270	230	15	1.4	1061	74	1691	27.3
53	15199	227	233	16	0.15	1035	127	2741	NA
40	15444	250	269	17	0.18	1054	84	2822	35.5
51	17430	312	285	19	0.03	1143	85	2735	38.6
45	17163	291	315	21	-	1121	99	3025	40.9
45	20790	462	NA	NA	NA	1121	102	2755	39.3
47	19699	402	354	22	0.02	1171	117	3139	48.5
55	21574	372	333	22	-	1221	116	3702	58.0
68	25837	381	NA	NA	-	1284	143	3375	33.0
74	28334	368	330	19	-	1445	150	3640	39.7
88	29534	304	274	16	-	1556	197	4003	47.6

Source : Table 4:2 and 4:3 NA : = Not available

TABLE NO. FOUR

WAGE - STRUCTURE

on/ of	Maz-door	Weaver Power-loom	Weaver Hand-loom	Miller	Darn-er	Piecer	Hand Spinn-er	Willow machi-ne man	Asstt. Super visor
	2	3	4	5	6	7	8	9	10
d rkers	2405	1866	1173	952	876	867	59	52	53
gs	2.76	3.86	2.23	2.93	3.98	3.47	1.31	1.59	5.55
g- onus	0.01	-	-	-	-	0.01	-	-	-
an- us	-	-	-	-	-	-	-	-	-
Allo-	-	-	0.02	-	-	0.01	-	-	-
me t	-	-	-	-	-	-	-	-	-
	0.11	0.35	0.07	0.13	0.11	0.10	-	0.10	0.54
e per daily gs(Rs.)	2.88	4.21	2.32	3.12	4.09	3.59	1.31	1.69	6.09
rcen-	99.8	100	99.7	83.3	37.9	100	100	100	100
."-	0.2	-	0.3	16.5 0.2(c)	62.1	-	-	-	-
ated tage	98.3	0.5	1.3	39.2	74.7	63.	28.8	69.2	100
Rated tage	1.7	99.5	98.7	60.8	28.3	37.0	71.2	30.8	-
e Min. .)	2.90	2.74	2.31	2.54	3.55	3.32	0.71	1.67	4.23
e Max., .)	3.17	6.12	4.43	4.45	4.87	3.46	1.74	1.86	10.78

Source: Extracted from Table 4:1

C = Children

In the previous pages, we have studied the problems characteriestics and wage structure (including wage differentials caused by sex, environment etc.,) theoritically. Now, it will be interesting to establish and verify the relationship between the wages, productivity, and consumers' Price Index Number statistically.

4:4 AVERAGE YEARLY EARNINGS (1950-'64)

An attempt has been made to calculate average yearly earnings trend in regards to the employees of the woollen textile industry during 1950-'64.

It has been preferred to fit a parabolic regression of the second degree, only because of the fact that the second difference of the dependent variable(Y), defined as

$$\triangle^{2} Y_i = \triangle Y_i - \triangle Y_{i-1}$$

is almost nearly constant, and satisfies the conditions for the line of best-fit. This is shown in the following table.

TABLE FIVE

Reference Table No.	Regression Used	Regression Equation	Annual Rate	Residue
1	2	3	4	5
4:6	Parabolic	$Y = 4.19 + 0.118\ t + 0.006\ t^2$	4.27	1.03

(Vide Fig. 4:1)

Source : Table 4:6

Y stands for average yearly earnings in terms of money of the persons employed in the industry, t for time, measured in years with reference to 1957 as origin. Hence we conclude that our parabolic regression shown by the equation

$$Y = 4.19 + 0.118\ t + 0.006\ t^2$$

represents the best-fit line with a positive acceleration (=.006) and annual rate (= 0.118).

GOODNESS OF FIT TEST ((33,37, 38))

It is worth while to apply the Chi-squared test (i.e. χ^2- test), which is test of the agreement(or consistency) between a theoritical(hypothetical) and sample distribution. Karl Pearson's approximation, which is shown as

$$\chi^2 = \sum \frac{(n_i - np_i)^2}{np_i}$$

may be, schematically as,

$$\chi^2 = \sum \frac{(O_y - E_y)^2}{E_y}$$

where O_y is the observed, and E_y is the expected frequency. As it is clear this χ^2 may be considered as a measure of discrepancy between O_y and E_y. If, there is no discrepancy, then $\chi^2 = 0$. Suppose our sample distribution agree with the hypothetical(theoretical) distribution. In other words our nul-hypothesis is

$$H_1 : O_y = E_y$$

The value of χ^2 of the χ^2- test is given by,

$$\chi^2 = 0.563 \text{ (vide table 4:6)}$$

The 5 five percent critical value of the $\chi^2 = 22.4$ corresponding to 13 degrees of freedom is greater than the computed value of $\chi^2 = 0.563$. The computed value of χ^2 does not lie between the"rejection-region", that is, $\chi^2 \gg 22.4$.

CONCLUSIONS:

(a) Hence χ^2 for 5 percent level of significance our $\chi^2 = 0.563$ is not significant.

(b) So our fit is good and there is great agreement between observed and theoretical value of earnings of the employees of woollen industry.

(c) In other words, our parabolic line $Y = 4.19 + 0.118t + 0.006\, t^2$, is best fit line to the data of the table 4:6.

After seeing the figure 4:1 it is obvious that error is negligible.

4:5.1 RELATIONSHIP BETWEEN YEARLY WAGE BILLS AND YEARLY VALUE ADDED"

It is interesting to study the total yearly wage payments in relation of the total production in money terms. (Value added).

A linear regression of X (Salaries and Wages) and Y(Value added) is calculated by the help of least-squared method in table 4:7, which can be seen from the following table.

The linear regression equation represents the bestfit and corresponding equation is,

$X = 0.64 + 0.39\ Y$

which explains X in terms of Y. The co-efficient of regression b_{xy}=0.39.

It indicates that during 1950-'64 the total wage bills has increased at a rate of 0.39 yearly

TABLE SIX

Reference Table No.	Regression used	Regression Equation	Annual Rate	Residue
1	2	3	4	5
4:7	Linear	$X = 0.64 + 0.39Y$ (Vide Fig. 4:2)	2.9	23.52

Source-Table 4:7

The significance of b_{xy} is tested by the t-test. The relevant value of t is given by,

$$t = (b_{xy} - \beta_{xy}) \sqrt{(n-2) \quad \Sigma(Y-\bar{Y})^2 / \Sigma(X-\bar{X})^2}$$

Assuming $\beta_{xy} = 0$ and substituting the various values from Table 4:7,

$$t = 0.39 \sqrt{13 \times 133.02 / 93.52}$$

$$= 0.39 \times 8.59$$

$$= 3.3501$$

Which is greater than the 5 percent, critical value of t = 1.7 corresponding to 13 degrees of freedom. Hence, we accept the nul-hypothesis and our empirical regression co-efficient b_{xy}=0. is significant. Therefore, there is sufficient reason to belie that population exhibits a linear relationship between salaries and wages and value added. So increase in wages is not merely due to chance.

4:5.2 RELATIONSHIP BETWEEN YEARLY WAGE BILLS AND YEARLY VALUE ADDED:

It is interesting to study the total yearly wage payments in relation of the total production in money terms

(value added).

A linear regressionof Y (value added in 10 thousands Rs. on X(Wage bills in ten thousands Rs.), is calculated by the hel of least-squared method in Table 4:7, which can be seen from t following table;

TABLE SEVEN

Reference Table No.	Regression used	Regression Equation	Annual Rate	Residue
1.	2	3	4	5
4:7	Linear	$Y = 2.19\ X - 0.55$ (Vide Fig. 4:2)	5.9	133.02

Source : Table 4:7

The linear regression equation represents the best-fit and the corresponding equation is,

$$Y = 2.19\ X - 0.55$$

which explains Y in terms of X, Y being the value added and th co-efficient of regressionis given by $b_{yx} = 2.19$.

It indicates that, during 1950-'64, the value added decreases at an average rate of 0.55 per year.

The significance of b_{yx} is tested by the t-test, The relevant value of t is given by

$$t = (b_{yx} - \beta_{yx}) \sqrt{(n-2) \quad \sum(X-\bar{X})^2 / \sum(Y-\bar{Y})}$$

Assuming $\beta_{yx} = 0$, and substituting the various values from table 4:7.

$$t = 2.19 \sqrt{13 \times 23.52 \ / \ 133.02}$$

$$= 2.19 \times 1.5$$

$$= 3.285 \text{ (Approximately)}$$

which is greater than the 5 percent critical value of t = 1.771 corresponding to 13 degrees of freedom. Hence we reject the nul-hypothesis and our empirical regression co-efficient $b_{yx} = 2.19$ is significant. There is sufficient reason to believe that population exhibits a linear relationship between salaries and wages and value added. So, increase in value added is not merely by chance, but by due to affect of wage bills.

4:6 CORRELATION BETWEEN WAGES OF WORKERS AND VALUE ADDED:

An attempt has been made to calculate the Karl Pearson's correlation Co-efficient between total value added (in m.Rs.) and wages paid to the workers (in million Rs.) for a period of 15 years from 1950 to 1964, by the following formula,

$$r = \frac{\Sigma xy - n\ (\Sigma x/n)\ (\Sigma y/n)}{n\sqrt{\left\{(\Sigma x^2/n) - (\Sigma x/n)^2\right\}\left\{(\Sigma y^2/n) - (\Sigma y/n)^2\right\}}} \quad 4$$

On putting the various values from table 4:5, the value of r is given by

$$r = \frac{44.73 - (-7.6)\ (-16.6/15)}{15\sqrt{\left\{(14.54/15) - (-7.6/15)^2\right\}\left\{(150.58/15) - (16.6/15)^2\right\}}}$$

$= 0.97$ (Approximately)

It is worthwhile to test the significance of this correlation co-efficient to strengthen our statement. This can be tested by the use of t-distribution or by nul-hypothesis. Here we will use both, t-distribution test and sampling distribution test for r.

SIGNIFICANCE OF CORRELATION COEFFICIENT 'r'

(i) By using t - distribution:

The value of t, under the hypothesis that the correlation coefficient (ρ) on the population is zero, is given by

$$t = r \,/\, \sqrt{(1 - r^2) \,/\, (n-2)}$$

which has t-distribution with ϕ = n-2 degree of freedom.

Putting the various values from table 4:6, the value of t is given by

$$t = 0.97 \,/\, \sqrt{(1-0.97^2) \,/\, (15-2)}$$

$$= 14.2 \quad \text{(approximately)}$$

which is greater than the five percent critical value of t = 1.771 for (15.2) or 13 degrees of freedom. The computed value of t, therefore, does not lie in the "acceptance area" of the t-distribution and we are inclined to reject the hypothesis that $\rho = 0$.

Hence, correlation co-efficient 'r' = 0.97 is significant ~~si~~ at 5 percent level.

Therefore, there is a strong correlation between Total value added and wages paid to the workers. It is not merely by chance.

ii) USE OF CORRELATION CO-EFFICIENT TABLE:

When $\rho = 0$ we may find an exact sampling distribution of 'r' that is symmetric around zero with a variance r of

$$\text{Variance } (r) = (1-r^2) / \sqrt{(n-2)}$$

A characteristic of the sampling distribution of 'r' is that it depends only on ρ and n. Since we have assumed $\rho = 0$, it means that the sampling distribution for this case depends only on 'n'. Hence, the probable value of 'r' will only depend upon the 'n'.

The probable value of r for $\phi = n-2$ (= 13) degrees of freedom at 5 percent level of significance is = 0.5319, which is less than the calculated value of r. The computed value of 'r' therefore, does not lie in the "acceptance area", that is

$$P\ (-0.5319 < r < 0.5319) = 0.95,$$

of the r-distribution and we are inclined to reject the hypothesis, that $\rho = 0$. Hence, correlation co-efficient r = 0.95 is significant at 5 percent level.

CONCLUSION:

Therefore, like t-test the significance of 'r' is strongly supported by the use of r-tables also. In other words, the correlation between value added and wages of the workers in the woollen industry is significant and it is not merely by sampling or chance.

4:7 TOTAL AVERAGE YEARLY EARNINGS, CONSUMERS PRICE INDEX NUMBER AND PRODUCTIVITY (1950 - 1964):

A multiple linear regression of Y (Indices of total average yearly earnings, 1951 as base), on X_1 (Consumer Price Index Number, base 1951) and X_2 (Value added per person i.e. productivity index number, 1951 as base) is calculated by the

help of least squared method in table 4:8.

It comes out to be

$$Y = + 0.147 + 0.959X_1 - 0.102\ X_2$$

According to the regression equation, the average yearly earnings(Y) increased on an average of 0.959 thousands Rs. for percentage of Consumers Price Index Number (X_1) at the beginning, but decreased slowly by an average of 0.102 Rs. thousands for each percentage increase of Index Number of Productivity(X_2). During the period of Study, (1951-1964), the productivity of the workers have been less effective in influencing the total yearly average earnings of the employees of Woolen textile industry as compared to the Consumers Price Index Number. The partial regression co-efficient ~~by~~ $b_{y1.2}$ and $b_{y2.1}$ are respectively given by 0.959 and (-0.102). Their significance is tested by the use of t-test.

SIGNIFICANCE OF $b_{y1.2}$

The value of t-test is given by

$$t = (b_{y1.2} - \beta_{y1.2}) \sqrt{(n-k-1)\ \Sigma(X_1 - \overline{X}_1)^2 / \Sigma(Y - \overline{Y})^2}$$

where,

$\beta_{y1.2}$ is the corresponding paratial regression co-efficient in the population from which the regression data have been drawn. We shall test the hypothesis that a change in X_1 in the population/produce any change in the earnings of the employees. Therefore, in value of t is given by

$$t = b_{y1.2} \sqrt{(n-k-1)\ \ \Sigma(X_1 - \overline{X}_1)^2 / \Sigma(Y - \overline{Y})^2}$$

where, n = total number of observations,

K = number of co-efficients to be determined,

(n - k-1)= the number of degrees of freedom,

Putting the various values from Table 4:8, the value of t is given by,

$$t = 0.959 \times \sqrt{11 \times 0.32 / 0.23}$$

$$= 0.959 \times 1.2$$

$$= 1.1508$$

which is less than the 5 percent critical value of t = 1.796 for (n - k - 1) or (14-3) or 11 degrees of freedom. The computed value of t, therefore, lies in the "acceptance area" of t - distribution and we are inclined to accept the hypothesis that $\beta_{y1.2} = 0$. The change in average yearly earnings of the employees of the Woollen Textile Industry as a result of unit change in Consume s Price Index Number, shown by regression equation is thus due to sampling or chance only.

<u>SIGNIFICANCE OF</u> $b_{y2.1}$

The value of t, under the hypothesis that corresponding partial regression co-efficient $\beta_{y2.1}$ in the population is zero, is given by,

$$t = b_{y2.1} \sqrt{(n-k-1) \quad \Sigma(X_2-\bar{X}_2)^2 / \Sigma(Y - \bar{Y})^2}$$

where n and k have their usual meanings.

Putting the various values from table 4:8, the value of t is given by,

$$t = -0.102 \sqrt{11 \times 1.02 / 0.23}$$

$= -0.102 \times 2.00$

$= -0.204$ (Approximately)

which is less than 5 percent critical value of $t = 1.796$ for 11 degrees of freedom. The computed value of t, therefore, lies in the "acceptance area" of the t - distribution and we are inclined to accept the nul hypothesis, that is $\beta_{y2.1} = 0$. So our regression co-efficient $b_{y2.1} = -0.102$ is not significant. The change in average yearly earnings of the employees of the Woollen Textile Industry, as a result of unit change in the productivity indices, shown by regression equation is only due to chance or sampling.

CO-EFFICIENT OF MULTIPLE CORRELATION $R_{y.12}$

The co-efficient of multiple correlation between the average yearly earnings of the employees of Woollen Textile Industry(Y) on the one hand and Consumers Price Index Number (X_1) and productivity indices (X_2) the other, is found to study the combined importance of the latter to the former.

It is given by

$$R^2_{y.12} = \frac{\sum_{=1}^{14} (Y' - \bar{Y})^2}{\sum_{=1}^{14} (Y - \bar{Y})^2}$$

where, Y' is the calculated value of corresponding X_1 and X_2. Putting the various values from table 4:8, the value of $R^2_{y.12}$ is given by,

$$R^2_{y.12} = 0.206 \; / \; 0.230$$

$$= 0.809 \text{ (Approximately)}$$

The square of the multiple correlation coefficient (also known as coefficient of determination((11, 33, 37, 38))) indicates

that about 80.9 percent of the variation in the average yearly earnings of woollen industry (Y) is determined by the Consumers Price Index Number (X_1) and productivity index Number(X_2). The remaining 19.1 percent of the variation in Y remains unexplained and is determined by certain other factors like, size of establishment, trade union movement impact, etc., which have not been accounted.

SIGNIFICANCE OF $R^2_{y.12}$

In order to verify if this conclusion is also true about the population from which the regression data are drawn, the significance of $R_{y.12}$ is tested by the help of F-test. The relevant value of F of the F-test is given by,

$$F = \frac{\text{Variance explained by the Regression Equation}}{\text{Residue variance}}$$

for k, and (n-k-1) degrees of freedom, where k is the number of variables eliminated. The hypothesis being tested is that $\rho_{y.12} = 0$, when $\rho_{y.12}$ is the co-officient of multiple co-rrelatic in the population.

The following table gives the familar break-up summary of variance

TABLE EIGHT

ANALYSIS OF VARIANCE SUMMARY FOR THE OBSERVED REGRESSION DATA

Source of variance	Sum of Squares	Degrees of Freedom	Mean Squares
1	2	3	4
Total	$\sum_{=1}^{14} (Y - \bar{Y})^2 = 0.23$	$(n-1)(= 13$	$\sum_{=1}^{14} (Y' - \bar{Y})^2/k = 0.206/2 = 0.103$
Linear Regression	$\sum_{=1}^{14} (Y' - \bar{Y})^2 = 0.206$	$k = 2$	
Residuals from Regrssion	$\sum_{=1}^{14} (Y - Y)^2 = 0.1316$	$(n-k-1) = 11$	$\sum_{=1}^{14} (Y - Y')^2 / (n-k-1) = 0.0119$

Source :Table 4:8

Therefore, the value of F of the F-test is given by

$$F = 0.1030 / 0.0119$$
$$= 8.66 \text{ (Approximately)}$$

which is greater than the 5 percent critical value of F=3.98 corresponding to 2 and 11 degrees of freedom. The F-ratio is significant. The computed value of F=8.66 lies in the rejection region" of the F-distribution. The hypothesis, $\rho_{y.12}$ is therefore, rejected. This means that in the population, the variance in the total average yearly earnings (Y), is accounted for by linear regression on Consumers Price Index Number(X_1) and the productivity index number(X_2). The conclusion about $R_{y.12}$ is, therefore, strengthened and is not due to change.

4:8 SIZE OF ESTABLISHMENT, PRODUCTIVE CAPITAL, WAGES AND PRODUCTIVITY: (VIDE TABLE 4:10)

Woollen Textile Industry, which occupies an important place in the industries of India also confirms the hypothesis that labour productivity increases with the size of establishments. In the case of Woollen Textile Industry, productivity has increased more than two times, when we move from the classification by employment from group below 20 to the group 20-49. It has increased with the increase in the size of establishment excepting one group of employment i.e. from 250 - 499, in which productivity has declined. The reason for this can be stated as that in this group there were highest number of factories employing the highest number of persons, which are responsible for disguised unemployment.

Secondly, this industry also runs under the same equipment pattern. Similarly the smaller size establishments are for spinning whereas larger ones are composite; so naturally it is concluded that smaller units require less capital than the larger units, which can be seen from the Table No.4:10. As the size of establishment according to employment increased from the group 20 - 49 to 250 - 499, the Productive Capital requirement increased from one percent to 22.6 percent. It has also increased upto 50 percent as the group goes to 2000-4999. Similarly, materials and Fuels etc., also has increased 0.1 percent to 36.5 for the same establishments and go upto 29.8 percent for the group 2000-4999.

In order to verify the relationship between labour productivity and wages with reference to the size of establishment an attempt has been made to calculate a linear logari-

thmic regression of Production (Value added Y), on productivity X, defined as P/W), where P is the production and W is the number of wage earners), by the method of least-squared in Table 4:9

The summary of the analysis table is given as below:

TABLE NINE

Ref. Table No.	Regression used	Regression Equation'*'	Rate of change according to size of Establishment	Residue
1	2	3	4	5
4:9	Linear Logarithamic	Y = 1.771X + 0.19	6.3	7.52
4:10		(Vide Fig. 4:3)		

Source:Table 4:9, 4:10 . * X = Log P/W,
Y = Log P

Linear regression shown by the equation

Log P = 1.771 Log P/W + 0.19

represents the line of best fit.

It is worthwhile to apply the t-test to test the significance of b-the least squared regression co-efficient as obtained by the bestfit regression equation. Suppose β is the hypothetical population regression co-efficient. By supposing $\beta = 0$ we may test the hypothesis that, in the popularity the regression co-efficient is zero. This means that there is no relationship between Log P and Log P/W (i.e., Y & X) in the population.

The value of t of the t-test is given by,

$$t = (b - \beta) \sqrt{(n-2) \ \Sigma(X-\bar{X})^2 / \ \Sigma(Y-\bar{Y})^2}$$

The quantity t follows the so called t-distribution with (n-2) degrees of freedom (is being the number of observation because two constants(a & b) have been eliminated from the data.

Therefore, on putting the various values ofrom Table 4:9 4:10, the value of t is given by

$$t = 1.771 \sqrt{(8-2) \ 0.56 \ / \ 7.52}$$

$$= 1.771 \quad x \quad 0.6$$

$$= 1.0626 \quad \text{(Approximately)}$$

which is less than 5 percent critical value of t = 1.943 corresponding to 6 degrees of freedom. Hence, we accept the nul-hypothesis, and our empirical regression co-efficient (b = 1.771) is not significant. It is concluded therefore, our conclusion is weakend and has arisen merely by chance.

4:9 PROFITS:

Profit study in the case of Woollen Textile Industry is also based upon the Reserve Bank of India's Study ((76,77)). Here, also like Cotton, due to the variations in the number of companies studied in all the three periods, no clear statistical analysis is possible. So it was thought proper to study it under three separate heads viz., (1) Profits before tax (2) Profits after Tax and (3) Profits as a percentage of Net Worth for the whole period of 1950 to 1964.

4:9.1 PROFITS BEFORE TAX:

Estimated profits before tax decreas in the period 1950-'51 and 1952-'53 from Rs. 45 lakhs to Rs. 5/- lakhs and thereafter increase upto Rs. 149 lakhs in 1955-56. The Profits before tax increased approximately more than 4 times in 1960-'61 to that of 1955-'56, (actual estimated profits before tax amounts Rs.150/- lakhs and Rs. 639 lakhs.). There is declining tendency in the period 1960-'61 to 1962-'63 from Rs. 683 lakhs to Rs. 573 lakhs. (Vide Table 5:4.11).

4:9.2 PROFITS AFTER TAX

Estimated profits after tax follow the path similar to that of the profits before tax through out the period, 1950-to 1964. It first decreased from Rs. 25 lakhs(in 1950-'51) to Rs.2 Lakhs(in 1952-'53) and then increases upto Rs. 129 lakhs in 1955-'56.

In the case of the second series, the profits after tax have increased from Rs. 129 lakh to Rs. 496 lakhs in 1955-'56 to 1960-'61 respectively. The tendency is reverse in the third series.of There is a declining tendency, (Vide Table 5:4.11).

4:9.3 PROFITS AFTER TAX AS A PERCENTAGE OF NET WORTH:

Like the above two, profits after tax as percentage of net worth have declined from 3.5 to 0.5 (from 1950-'51 to 1952-'53) and have increased upto 11.4 in 1955-'56.

There is an increasing trend in the second series and declining in the third series from 9.3 to 21.9(in 1955 - '56 to 1960 - '61) and 19 to 11.8(in 1960-'61 to 1962-'63) respectively.

It should be noted here that all the profits data studied here are mixed with the Silk and Rayon Textile data.

4:10 CONCLUSIONS:

On the basis of the above statistical study the following inferences can easily be drawn:

(a) there is a strong correlation between total value added and wages paid to the workers. In other words, production in Woollen Industry very much depends on the wages paid to the workers. (Vide Section 4:6)

(b) the total earnings of the employees of the woollen industry in the period 1950-'64 follow a parabolic trend given by

$$Y = 4.19 + 0.118\ t + 0.006\ t^2$$

which has an average trend of 0.118 (Yearly) and a positive acceleration of the order of 0.006. (Vide section 4:4).

The error (Vide Fig., 4:1)has been caused only due to the handlings and smoothing of the data. Cyclical nature of the error is due to some payments of overtimes, bonouses and arrears etc.,.

(c) total wage bills bear a linear relationship with the value-added. Its trend value is positive. Therefore, it is inferred that not only wages of the workers, but also total earnings inclusive of the salaries and money-value of benefits and previleges of the employees of the Woollen Textile Industry explain the value added of the industry. (Vide Section 4:5.1, 4:5.2).

(d) the multiple correlation co-efficient is highly significant. Hence, considered together, the Consumers

Price Index Number and value - added per person(productivity) satisfactorily explain the total earnings of the employees of the Woollen Textile Industry.

However, neither Consumers Price Index Number, nor productivity, explains satisfactorily the total earnings, when considered separately. In other words, neither productivity, after the elimination of Consumers' Price Index Number; nor Consumer Price Index Number after elimination of productivity could explain the total earnings of the employees. (As $b_{y1.2}$ and $b_{y2.1}$ are not significant). (Vide Section 4:7).

(e) linear logarithamic regression does not support the thesis that production and productivity bear a positive correlationship in this industry with the increase of the size of establishments.

Apart from the above statistical results, it will rather interesting to present a brief sketch of the findings of the occupational wage survey. ((68, 73)).

The Woollen Textile Industry has great potential for development. It has already its export potential. It is triple oriented, namely defence, domestic, Consumers and Overseas consumers. If the industry is assured of necessary foreign-exchange to import its essential raw materials it will not merely be able to satisfy the domestic demands, completely but will also contribute

substantially to the export earnings of our economy((57)).

Given proper encouragement and support from the Government, adequate foreign exchange allocations, proper understanding of the need of modernising plant and equipments, the industry can definitely accept the competitions posed by advanced countries in the matter of exports in the world markets. It may be necessary that the industry, in co-operation with the Government may have to adopt newer techniques of export marketing and there is much that India can learn from the experience of the many advanced countries in this direction.

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CHAPTER 5

JUTE TEXTILE INDUSTRY

CHAPTER FIVE

JUTE TEXTILE INDUSTRY

5:1 INTRODUCTION:

As early as 800 B.C., Jute was grown as a medicinal plant and was also used as a vegetable. In recent times it is grown in Indo-Pak sub-continent - in West Bengal, Assam, Bihar, Orissa, Uttar Pradesh, Tripura as well as in East Pakistan. Out of 40 species of Jute, only two varieties, the "White" and the "Tossa" Jute, are of Commercial importance. The main reasons for the cultivation of Jute in these areas are favourable soil and whether conditions, availability of labour, irrigation and rotting facilities, humid climate with rainfall varying between 50" and 70" between March and October with temperature of 83 Degrees Fahrenheit. India and Pakistan are the main producers of Jute, sharing between them 73 percent of the world output. Their individual share in the World production of Jute in the year 1958-'59 was 33 percent and 40 percent respectively (Jute in India 1958-'59, pp.1).

Inspite of the factors given above, Calcutta offered excellent port facilities. Inland water transport was cheap. The proximity of Calcutta to Bihar / Bengal. Coal-belt assured sufficient power to the Jute Mills, who also found a ready reserves of textile workers in the lower Bengal districts, many of which had been thriving centres of hand-spinning and weaving of Jute for nearly a century before the founding of the Indian Jute mill Industry.

The Jute industry occupies a position of strategic importance in the scheme of India's planned development, having been the country's largest foreign exchange earner for six consecutive years. Jute and Jute goods are a principal source of revenue with the present taxes and duties, the annual earnings of Central and State Governments from Jute are of the order of Rs.70/- crores. The Jute industry is important from the point of view of employment also. The total employment ((3,69,35,80)) in 1964 was merely 2,56,405. Out of which workers and other than workers were 23,8777 and 17,628 respectively. The growing of Jute provides livelihood to nearly 40 lakh farm families, in the jute growing states of West Bengal Assam, Bihar, Orrisa and Uttar Pradesh and is the biggest single employer of labour in West Bengal. The industry serves and receives services from many ancilliary industries and commercial undertakings, local machinery manufacturers and suppliers of accessories and spare parts, fuel and power suppliers, rail and road services, inland water transport, banking, shipping, insurance and so on. Infact, the entire economy of West Bengal is inextricably bound up with the economy of the Jute Industry. The production of Jute Mills machinery in India has led to the setting up of a new industry which has helped the Jute industry in its modernization and rationalization programmes and has also saved foreign exchange.

After independence, Jute industry had to face many problems from many directions. The Jute industry experienced great scarcity of raw jute, as 80 percent jute producing

area went to Pakistan. The devaluation of Rupee in 1949 also adversely affected the jute trade between India and Pakistan. India had to face the problem of inadequate amount of good quality of Jute to meet the foreign competition in foreign markets. Mesta, whose production very much depends on agriculture and monsoon, has helped in meeting the scarcity of raw jute upto some extent. Jute Buffer stock Association (1962) is one of the major steps taken in this direction.

Secondly, Jute industry has to face competition in foreign markets with Holland, Belgium etc., who produce Jute goods using the modern and developed technology, with the result that the quality of their Jute is and of a higher order and the cost of the production is considerably low and these countries have captured the foreign market. Therefore in India old traditional methods of production should be discarded in order to meet this competition. Study groups should also go abroad to study the international market.

Thirdly, lack of adequate foreign exchange is a big handicap in the modernization of Jute. Industry in India. The member countries of the European Common Market have levied heavy import duty in order to discourage the producers of Jute in India. Besides these countries have fixed the quota of Jute import. These problems have proved to be great hurdles for India in the International market.

The near substitutes of the Jute Textiles have also posed a problem for the jute industry ~~of India~~ of India.

Many countries use Burlap, Poly-prophlene, paper etc.,((36)). for packing, weaving and bags in place of Jute goods. Indian Jute mills Association Research Institute has provided several alternative uses of Jute goods which will minimise the dangers created by the problems, listed above.

The question of permanency of workers and employment of Budlis was fully gone into by the Central Wage Board for the Jute Industry((80)). The Wage Board unanimously recommended that there should be a certain number of non-permanent workers in the industry, as substitutes to stand by. Taking these factors into account the Wage Board fixed a permanent cadre in all the units in the industry and was unanimously of the opinion that the fixation of this permanent cadre would set at rest all dispute in this regard.

5:2 EMPLOYMENT STRUCTURE:

In the year 1958 as stated in the Occupational Wage Survey, ((68)), there were, in all, 167 occupations employing 2.53 lakhs of workers in the Jute mill industry in all the strata through out the country.

Of these, about 2.36 lakh workers were employed in West Bengal in 161 occupations and 16000 in other parts of the country i.e. in Andhra Pradesh, Utter Pradesh, and Madhya Pradesh in all occupation in the industry. Out of the total occupation covered, the data-presented in respect of the individual occupations in the report pertain to 116 occupations in the industry as a whole, 115, in West Bengal and 100 in other parts of the country.

A small part of (i.e. 4%) of the working force employed in the industry consisted of women, who were engaged merely in

TABLE ONE

EMPLOYMENT STRUCTURE

No.of Factories Giving Returns	Average No.of days worked	Total Employ-ment ('000 persons)	Male Employ-ment Per Factory ('000)	Female Employ-ment Per Factory ('000)	Child Employ-ment per Factory ('000)	Total Employ ment per Factory ('000)
2	3	4	5	6	7	8
106	263	306.0	2.3	0.33	0.1	2.8
105	264	287.3	2.0	0.32	-	2.6
104	276	291.3	2.3	0.30	2.09	2.6
104	271	271.4	2.1	0.26	-	2.4
105	278	271.4	2.1	0.29	-	2.5
107	277	271.1	2.1	0.21	-	2.4
105	296	273.7	2.2	0.19	-	2.0
103	289	250.4	2.1	0.14	0.4	2.2
96	292	253.8	2.3	0.12	-	2.3
92	294	245.0	-	-	-	2.5
94	328	228.6	2.1	0.10	-	2.4
95	294	225.3	2.1	0.09	-	2.3
94	329	241.7	-	-	-	2.5
95	333	257.0	-	-	-	-
90	331	256.4	2.5	0.08	-	2.6

Source: Table 5:2 and 5:3

one fourth of the occupations covered. Children were not reported to be employed in any sampled unit in the industry.

The total employment in this industry for the simplicity and convenience may be classified in the following departments namely, Batching, Preparing, Spinning, Winding, Beaming, Weaving, Finishing, Packing, Mistries and Durwans etc., which can be seen from Table One.

5:3 WAGE STRUCTURE (Vide Table TWO)

On the basis of the data present in the occupational wage Survey (1958-'59) ((68)), the industry can be placed in the category of Low-Wage Industries. The average minimum and maximum wage rates for all occupations taken together, in this industry as a whole worked out to Rs. 2.87 and Rs.3.75 per day respectively. In most of the individual occupations the average minimum wage rates also did not exceed Rs. 4.00 per day. In the majority of cases, the maximum wage rates also did not exceed this amount.

The payment of dearness allowance as a separate components of wages was an important feature of the wage structure in this industry. It was found that this allowance was being paid to all the workers in all the sampled establishments. It was only West Bengal, where dearness allowance was exclusively paid on the basis of flat rate. In other states it was linked with Consumers Price Index Number and also with flat rate basis.

The average pay roll earnings of workers in all occupations taken to gether in the industry as a whole worked

one fourth of the occupations covered. Children were not reported to be employed in any sampled unit in the industry.

The total employment in this industry for the simplicity and convenience may be classified in the following departments namely, Batching, Preparing, Spinning, Winding, Beaming, Weaving, Finishing, Packing, Mistries and Durwans etc., which can be seen from Table One.

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The average pay roll earnings of workers in all occupations taken to gether in the industry as a whole worked out to be Rs. 3.27 per day per worker. The average daily

TABLE TWO

r. o.	Occupations	Estimated no. of workers	AVERAGE DAILY PER CAPITA EARNINGS (In Rs.) Basic earnings	Total Daily Earnings	PERCENTAGE OF Time Rated Workers	Piece Rated Workers	AVERAGE Minm. Wage rate in Rs.	Max., Wage Rate in Rs.
	2	3	4	5	6	7	8	9
	Weaver	67465	2.80	2.98	100	-	2.86	4.59
	Mazdoor General	32515	2.62	2.62	0.2	99.8	2.61	2.62
	Hessian Warp welf and sacking warp spiner	13714	2.93	2.93	96.9	3.1	2.94	2.96
	Sectional Sardar	8703	3.05	4.06	100.0	-	3.46	4.98
	Helper	1746	2.55	2.5[illegible]	86.4	13.6	2.55	2.55
	Sweeper	2472	2.59	2.59	58.9	41.1	2.57	2.59
	Teaser Feeder Receiver	975	2.58	2.58	100.0	-	2.58	2.58
	Softer Feeder Receiver	279	2.58	2.58	100.0	-	2.58	2.58
	Head Mistry	417	6.00	6.40	100.0	-	5.60	6.44
	Change Hand	310	5.83	6.12	100.0	-	5.73	6.11
	Sack Feeder	4395	2.64	2.64	90.8	9.2	2.65	2.65

Source : 5:1

NB: There was no occupationgetting production or incentive bonus, and shift allowance including others.

Excepting occupation Sectional Sardars, no occupation was getting attendance bonus. It was Rs. 0.01 for the Sectional Sardars

Overtime payment amounting Rs. 0.10, Rs. 0.40, 0.29 was being paid to the occupation - Weaver, - Head Mistry and Change Hand respectively

Excepting occupation Sweeper Teaser Feeder Receiver and Sack feeder, there were no women employment. The percentage of women employment in these occupations was 7.4, 15.8 and 62.9 respectively.

earnings ranged upto Rs. 4,.00 per day in most of the individual occupations employing most of the workers.

The practice of overtime working was found in a large number of establishments.

The incentive bonus schemes ~~were~~ found in a small number of workers covered was also quite small.

From the table 'A' it is seen that the number of weavers was the highest 67465. The average basic earning for this group was Rs. 2.00 per day. They received a Rs.0.10 per day as overtime payment. Minimum and maximum average daily wages for this occupation were Rs. 2.86 and Rs. 4.59 respectively. The ratio of minimum to maximum wage was 1:6. The number of mazdoors was 32515, who received Rs. 2.62 per day as basic wage.

Both, time and piece-rated system of payment are seen in the industry. Regional wage differentials are most frequent in this industry. In Andhra, where as bonus was paid U.P. never paid any bonus, Madhya Pradesh has adopted a production bonus. Bihar mills were paying bonus to the monthly rated employees like Clerks, Watch and Ward staff ((80)) wages of all categories of workers in Jute Industry are standardized. The existence of uniform rates of pay and other conditions of services have ensured that the workers in all units are treated on the same footing((69-a)).

The Central Wage Board for Jute has recommended two wage scales, one for persons employed in West Bengal Mills' and another for persons employed outside West Bengal. The Board has prescribed the wages, D.A., and Bonuses for operatives misteries and other workers for the mills within the West-Begal and outside the West-Bengal.

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Total yearly earning per worker ((vide Table :2,5:3)) shows increasing trend from Rs. 773 to Rs. 1447/- between 1950 to 1964. Total yearly earnings of the non-worker staff also increased from Rs. 2,013 in 1950 to Rs. 3,470 in 1964.

Money value of the benefits and previliges per person per year increased seven time i.e. from Rs. 17.87 in 1950 to Rs. 166.9 in 1964. Wages and Benefits inclusive of salaries has also increased from 59.1 to 77.1 in between 1950 to 1964 respectively.

Uptill now, we have seen the characteristics, problems and employment and wage structure of the Jute Industry. We have analysed the data of Census of Manafecturers, Annual Survey of Industries, Occupational Wage Survey and Central Wage Boards and National Commission on Labour. Now, it is interesting to study the relationship of wages,, total earnings to that of the productivity, Consumers Price Index Number etc. , (see the following sections) statistically.

5:4 AVERAGE YEARLY EARNINGS (1950 - '64)

An attempt has been made to calculate average yearly earnings trend in regards to the employees of the Jute industry during 1950-'64.

It is preferred to fit a parabolic regression of the second degree, only because of the fact that the second difference of the dependent variable(Y), defined as

$$\Delta^2 Y_i = \Delta Y_i - \Delta Y_{i-1}$$

is nearly constant, and satisfied the conditions for the line of bestfit. This is shown in the following table:

TABLE THREE

Reference Table No.	Regression Used	Regression Equation	Annual Rate	Residual
1	2	3	4	5
5:6	Parabolic	$Y = 3.51 + 0.109t + 0.004\,t^2$	3.58	0.53
	(Vide Figure 5:1)			

Source : Table 5:6

where, Y stands for average yearly earnings in terms of money of the persons employed in the jute industry, t for time, measured in years with reference to 1957 as origin.

Hence, we conclude that our parabolic regression shown by the equation

$$Y = 3.51 + 0.109t + 0.004\,t^2$$

represents the bestfit line with a positive acceleration (0.004) and annual rate (0.109).

GOODNESS OF FIT TEST:

It is worthwhile to apply the Chi - squared test (i.e. χ^2 -test), which test of the agreement (or consistency or confirmity) between a theoretical (hypothetical) and sample distribution. Karl Pearson's approximation, which is shown as,

$$\chi^2 = \sum \frac{(n_i - np_i)^2}{np_i}$$

may be schematically as,

$$\chi^2 = \sum \frac{(O_y - E_y)^2}{E_y}$$

where, O_y is the observed and E_y, expecte frequency. As it is clear, this χ^2 may be considered as a measure of discrepancy between O_y and E_y. If, there is no discrepancy, then $\chi^2 = 0$. Suppose our sample distribution agree with the hypothetical (theoretical) distribution. In other words, our null-hypothesis in

$$Hi : O_y = E_y$$

The value of χ^2 of the χ^2- test is given by

$\chi^2 =$ 0.123(Vide table 5:6). The 5 percent critical value of $\chi^2 =$ 22.4 corresponding to 13 degrees of freedom is greater than the computed value of $\chi^2 = 0.123$. The computed value of χ^2 does not lie in between the "rejection region", that is $\chi^2 \geqslant 22.4$.

CONCLUSIONS:

(a) Hence, χ^2 for 5 percent level of significance our $\chi^2 =$ 0.123 is not significant.

(b) So, our fit is good and there is a great agreement between observed and theoretical value of earnings of the employees of Jute industry.

(c) In other words, our parabolic line

$Y = 3.51 + 0.109^t + 0.004t^2$.

is best fit line to the data of the table 5:6

From the Fig., 5:1 it is clear that fit is good and error terms which are caused by the internal and external forces are more or less nil.

5:5.1 RELATIONSHIP BETWEEN YEARLY WAGE BILLS AND YEARLY VALUE ADDED --

It is interesting to study the total yearly wage payments in relation to the total production in money terms (value added).

A linear regression of Y(value added in 10 thousands Rs.) and X (Salaries and Wages) is calculated by the help of Least-squared method in table 5:7, which can be seen from the table given below:

TABLE FOUR

Reference Table No.	Regression used	Regression Equation	Annual Rate	Residue
1	2	3	4	5
5:7	Linear	$Y = 3.89+0.201\ X$	4.52	9.77
		(Vide Fig. 5:2)		

Source : Table 5:7

The linear regression equation represents the bestfit and the corresponding equation is given by

$$Y = 3.89 + 0.201\ X$$

which explains Y in terms of X, Y being the value added and the coefficient of regression is given by $b_{yx} = 0.201$

It is indicated that during 1950-'64, the value of added shows an increasing trend rate.

The significance of b_{yx} is tested by the t - test. The relavent value of t is given by

$$t = (b_{yx} - \beta_{yx}) \sqrt{((n-2) \quad \Sigma(X - \bar{X})^2 / \Sigma(Y - \bar{Y})^2}$$

Assuming $\beta_{yx} = 0$, and substituting the various values from tabl...

$$t = 0.201 \times \sqrt{(13 \times 2.96) / 9.77}$$
$$= 0.201 \times 2.01$$
$$= 0.4041 \text{ (Approximately)}$$

which is less than the 5 percent critical value of $t = 1.771$ corresponding to 13 degrees of freedom. Hence, we accept the null hypothesis and our empirical regression co-efficient $b_{yx} = 0.201$ is not significant. Therefore, there is sufficient reason not to believe that population exhibits a linear relationship between salaries and wages and value added. So, increase in value added is merely by chance.

5:5.2 RELATIONSHIP BETWEEN YEARLY WAGE BILLS AND YEARLY VALUE ADDED --

A linear regression of X (Salaries and Wages and Benefits) and Y (Value added) is calculated by the help of least-squared method in table 5:7, which can be seen from the following table.

TABLE FIVE

Reference Table No.	Regression Used	Regression Equation	Annual Rate	Residue
1	2	3	4	5
5:7	Linear	$X = 3.11 + 0.008Y$ (Vide Fig. 5:2)	3.1	2.96

Source: Table 5:7

The linear regression equation represents the bestfit and corresponding equation is

$$X = 3.11 + 0.008\ Y$$

which explains X in terms of Y. The co-efficient of regression $b_{xy} = 0.008$.

It indicates that during 1950-'64, the total wage bill has increased at a rate of 0.008 yearly.

The significance of b_{xy} is tested by the t-test. The relevant value of t is given by,

$$t = (b_{xy} - \beta_{xy}) \sqrt{(n-2) \quad \Sigma(Y-\bar{Y})^2 / \Sigma(X-\bar{X})^2}$$

Assuming $\beta_{xy} = 0$ and substituting the various values from table 5:7

$$t = 0.008 \sqrt{9.77 \times 13 \; / \; 2.96}$$

$$= 0.008 \times 6.5$$

$$= 0.052 \quad \text{(Approximately)}$$

which is less than the 5 percent critical value of t = 1.771 corresponding to 13 degrees of freedom. Hence, we accept the null hypothesis and our empirical regression on co-efficient b_{xy} = 0.008 is not significant. Therefore, there is sufficient reason not to believe that population exhibits a linear relationship between salaries and wages and value added. So increase in wages is merely due to chance.

5:6.6 CORRELATION BETWEEN WAGES OF WORKERS AND VALUEADDED

An attempt has been made to calculate the Karl Pearson's correlation co-efficient between Total value added (in million Rs.) and wages paid to the workers (in Million Rs.) for a period of 15 years from 1950 to 1964 by following formula

$$r = \frac{\Sigma XY - n\ (\Sigma x / n)\ (\Sigma y / n)}{n \sqrt{\left\{ (\Sigma x^2 / n) - (\Sigma x / n)^2 \right\} \left\{ (\Sigma y^2 / n) - (\Sigma y / n)^2 \right\}}}$$

on putting the various values from table 5:6, the value of r is given by

$$r = \frac{3.66 - (-4.5)\ (-1.7/15)}{15 \sqrt{\left\{ (2.99/15) - (4.5/15)^2 \right\} \left\{ (1.03/15) - (-1.7/15)^2 \right\}}}$$

$= 0.84$ (approximately)

It is worthwhile to test the significance of this correlation co-efficient to strengthen our statement. This can be tested by the use of t - distribution or by null - hypothesis. Here, we will use both, t-distribution test and sampling-distribution test for r.

SIGNIFICANCE OF CORRELATION COEFFICIENT 'r'

(i) By using t - distribution:

The value of t, under the hypothesis that the correlations coefficient ρ in the population is zero, is given by

$$t = r \Big/ \sqrt{(1 - r^2) / (n-2)}$$

which has t-distribution with $\phi = (n-2)$ degrees of freedom.

Putting the various values from table 5:5 the value of t is given by

$$t = 0.84 \Big/ \sqrt{(1-(0.84)^2) / (15-2)}$$

$= 5.639$ (approximately)

which is greater than the 5 percent critical value of t = 1.77 for (15-2) or (= 13) degrees of freedom. The computed value of t, therefore does not lie in the "acceptance area" of the t - distribution and we are inclined to reject the null hypothesis i.e. $\rho = 0$. Hence, our correlation coefficient r=0.84 is signicnt at 5 percent level.

Therefore, there is a strong correlation between total value added and wages paid to the workers. It is not merely by chance.

(ii) USE OF CORRELATION COEFFICIENT TABLE:

When $\rho = 0$, we find an exact sampling distribution of 'r' that is symmetric around zero with a variance r of

$$\text{Variance } (r) = (1 - r^2) \,/\, \sqrt{(n - 2)}$$

A characteristic of the sampling distribution of 'r' is that it depends only on ρ and n. Since, we have assumed $\rho = 0$, it means the sampling distribution for this case depends only on 'n'. Hence, the probable value of 'r' will only depend upon the 'n'.

The probable value of 'r' for $\phi = (n-2)$ or (= 13) degrees of freedom at 5 percent level of significance is = 0.5319, which is less than the calculated value of 'r'. The computed value of 'r', therefore, does not lie in the 'acceptance area', that is, ~~P (~~

P $(-0.5319 < r < 0.5319) = 0.95$, of 'r'-distribution and we are inclined to reject the hypothesis, that $\rho = 0$. Hence, correlation coeffcient r = 0.84 is significant at 5 percent level.

CONCLUSIONS:

Therefore, like t-test the significance of 'r' is strongly supported by the use of r-tables. In other words, the correlation between, value added and wages of the workers in the Jute industry is significant and is not merely due to chance.

Correlation coefficient 'r' is also calculated by the following formula.

$$r = \sqrt{(b_{xy} \cdot b_{yx})}$$

$$= \underline{0.84}$$

5:6 TOTAL AVERAGE YEARLY EARNINGS, CONSUMERS PRICE INDEX NUMBER AND PRODUCTIVITY (1951 - 1964)

A multiple linear regression of Y (indices of total yearly average earning) base 1951) on X_1 (Consumers Price Index Numbers, base 1951) and X_2 (Indices of Productivity, (base 1951) is calculated by the help of least-squared method in Table 5:8.

It comes out to be

$$Y = 0.214 + 0.91 X_1 + 0.03 X_2$$

According to the regression equation, the average yearly earnings(Y) increased on an average of 0.91 for each one unit of Consumer Price Index (X_1). Similarly, the regression coefficient of X_2, which is 0.03, will increase the total earnings 0.03 times for every one percent increase in productivity. During the period of study, the productivity

of the employee has been less effective in influencing the total yearly average earnings of the employees of Jute industry as compared to the Consumers Price Index Number. The partial regression co-efficient $b_{y1.2}$ and $b_{y2.1}$ are respectively given by 0.91 and 0.03. Their significance can be tested by the use of t-test.

SIGNIFICANCE OF $b_{y1.2}$

The value of t - test is given by

$$t = (b_{y1.2} - \beta_{y1.2}) \sqrt{(n-k-1) \quad \Sigma (X_1 - \bar{X}_1)^2 / \Sigma (Y-\bar{Y})^2}$$

where, $\beta_{y1.2}$ is the corresponding partial regression coefficient in the population from which the regression data have been drawn. We shall test the hypothesis that a change in X_1 in the population does not produce any change in the earnings of the employees. Therefore, the value of t of the t - test is given by,

$$t = b_{y1.2} \sqrt{(n-k-1) \Sigma (X_1 - \bar{X}_1)^2 / \Sigma (Y - \bar{Y})^2}$$

where, n = total number of observations,

k = number of co-efficients to be determined,

(n-k-1) = the number of degrees of freedom.

Putting, the various values from Table 5:8, the value of t - is given by

$$t = 0.91 \sqrt{11 \times 0.32 \ / \ 0.42}$$

$$= 0.91 \times 2.8$$

$$= 2.548$$

which is greater than the 5 percent critical value of t = 1.79 for 11 degree of freedom. The computed value of t, therefore does not lie in the "acceptance area" of the t-distribution and we are inclined to reject the null hypothesis, $\beta_{y1.2} = 0$. The change in average yearly earnings of the employe s of the Jute Industry as a real result of unit change in Consumer Price Index Number, shown by the regression equation is thus not due to chance, or sampling only.

SIGNIFIC NCE OF $b_{y2.1}$

The value of t, under the hypothesis that corresponding partial regression co-efficient $\beta_{y2.1}$ in the population is zero is given by

$$t = b_{y2.1} \sqrt{(n - k - 1) \; \Sigma(X_2 - \overline{X}_2)^2 / \Sigma(Y - \overline{Y})^2}$$

where n and k have their usual meanings. Putting the various values from table 5:8, the value of t is given by

$$t = 0.03 \sqrt{(11 \times 0.40) / 0.42}$$

$$= 0.03 \times 3.25$$

$$= 0.0975$$

which is less than the 5 percent critical value of (t) = 1.796 for 11 degrees of freedom. The computed value of t, therefore lies in the "acceptance area" of the t-distribution and we are inclined to accept the null hypothesis, that is $\beta_{y2.1} = 0$. So our regression coefficient $b_{y2.1}$ = 0.03 is not significant. The change in the average yearly earnings of Jute Industry, as a result of unit change in the productivity indices, shown by regression equation is only ...

CO-EFFICIENT OF MULTIPLE CORRELATION $R_{y.12}$

The co-efficient of multiple correlation between the average yearly earnings of the employees of Jute industry(Y) on the one hand and consumer price index number(X_1) and productivity indices (X_2) on the other, is found to study the combined importance of the latter to the former.

It is given by

$$R^2_{y.12} = \frac{\sum_{=1}^{14} (Y' - \bar{Y})^2}{\sum_{=1}^{14} (Y - \bar{Y})^2}$$

where, Y' is the calculated value of the corresponding X_1 and X_2.

Putting the various values from table 5:8, the value of $R^2_{y.12}$ is given by

$$R^2_{y.12} = 0.21 / 0.42$$
$$= 0.50 \quad \text{(Approximately)}$$

The square of the multiple correlation co-efficient (also known as co-efficient of determination ((38)), indicates that about 50 percent of the variation in the average yearly earnings of Jute Industry (Y) is determined by the Consumers Price Index number (X_1) and productivity indices(X_2). The remaining 50 percent of the variation in Y remains unexplained and is determined by certain other factors like size of establishment, trade union movements impact, etc., which have not been accounted.

SIGNIFICANCE OF $R^2_{y.12}$

In order to verify if this conclusion is also true about the population, from which the regression data are drawn

the significance of $R_{y.12}$ is tested with the help of F-test. the relevant value of F of the F-test is given by F

$$F = \frac{\text{Variance explained by the Regression Equation}}{\text{Residue Variance}}$$

for K and (n - k - 1) degrees of freedom, where k is the number of variables eliminated. The hypothesis being tested is that $\rho_{y.12} = 0$, where $\rho_{y.12}$ is the co-efficient of multiple correlation in the population.

The following table gives the familiar break-up summary of the variance.

TABLE SIX

ANALYSIS OF VARIANCE SUMMARY FOR THE OBSERVED REGRESSION DATA

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Squares
1.	2	3	4
Total	$\sum_{=1}^{14} (Y - \bar{Y})^2$ = 0.42	n - 1 = 13	$\sum_{=1}^{14} (Y' - \bar{Y})^2 / k$ = 0.21/2 = 0.1
Linear Regression	$\sum_{=1}^{14} (Y' - \bar{Y})^2$ = 0.21	k = 2	
Residue from Regression	$\sum_{=1}^{14} (Y - \bar{Y})^2$ = 0.11	(n-k-1) = 11	$\sum_{=1}^{14} \frac{(Y - Y')^2}{(n-k-1)}$ = 0.11/11 = 0.01

Source - Table 5:8

Therefore, the value of F of the F-test is given by

$$F = 0.105 \;/\; 0.01$$
$$= 10.5$$

which is greater than the 5 percent critical value of F=3.98 corresponding to 2 and 11 degrees of freedom. The F-ratio is significant. The computed value of F = 10.5 lies in the 'rejection region" of the F-distribution. The hypothesis, $\rho_{y.12}$ is therefore, rejected. This means that in the population, the variance in the total average yearly earnings (Y), is accounted for the linear regression on consumers price index number (X_1) and the productivity(X_2). The conclusion about $R_{y.12}$ is therefore, strengthened and is not due to chance

5:8 SIZE OF ESTABLISHMENT, PRODUCTIVE CAPITAL,WAGES AND PRODUCTIVITY

No establishment was found employing less than 249 persons in the factory. Highest number of factories (58) constituting 60.5 percent of the total factories present in the industry required 68.4% productive capital of the ~~total~~ total requirement of productive capital of the group 2000 - 4999.

Capital intensity has increased with the size of establishment. Unlike the other textile groups there are less establishments in the handloom sector.

A close scrutiny of the table shows that productivity and the size of establishment bear a positive correlationship, i.e. it has increased with the increase in the size of establishment.

Now to verify a relationship that labour productivity and wages in regards to the size of establishment, an attempt has been made to calculate a linear logarithmic regression of production (value added, Y) on productivity (X, defined as P/W, where P is production and W is number of Wage Earners), by method of least-squared in Table 5:9.

The summary of the analysis table is given as below:

TABLE SEVEN

Reference Table	Regression Used	Regression* Equation	Rate of Change according to size of Establishment.	Residue
1	2	3	4	5
5:9 5:10	Linear Logarithmic	$Y = 0.152 + 2.262X$ (Vide Fig.5:3)	6.7	13.27

* Source Table 5:9, 5:10

$X = \text{Log } P/W$

$Y = \text{Log } P$

Linear regression shown by the equation

$\text{Log } P = 2.262 \text{ Log } P/W + 0.152$

represents the line of best-fit.

It is worthwhile to apply the t-test to test the significance of b, the least-squared regression co-efficient as obtained by the best-fit regression equation. Suppose β is the hypothetical population regression equation co-efficient. By supposing $\beta = 0$, we may test the hypothesis that, in the population, the regression co-efficient is zero. This

(i.e. Y and X) in the population.

The value of t of the t - distribution ~~on~~ is given by

$$t = (b - \beta) \sqrt{(n-2) \quad \Sigma(X-\bar{X})^2 / \Sigma(Y-\bar{Y})^2}$$

The quantity t follows the so called t-distribution on with (n-2) degrees of freedom, n being the number of observations, because two constants (a & b) have been eliminated from the data.

Therefore, on putting the various values from table 5:9 and 5:10, the value of t is given by

$$t = 2.262 \sqrt{(6-2) \times 1.25 / 13.27}$$

$$= 2.262 \times 0.61$$

$$= 1.3798 \text{ (Approximately)}$$

which is less than the 5 percent critical value of t = 2.132 corresponding to 4 degrees of freedom. Hence, we accept the null hypothesis and our empirical regression co-efficient b = 2.262, is not significant. It is concluded, therefore, that our conclusion regarding labour productivity and production is not supported and it has arisen merely by chance.

5:9 PROFITS:

Like Cotton and Woollen Textile, the profit data are not available excepting the Reserve Bank of India's Study.((77)) So far analysing the profitability, the above mentioned. Statistics under the same three series of the profit data are to be used (See Table 5:11 Statements 5:1,2,3.). Here also we will study the entire period of 1950 to 1964, in to three

broad heads viz. profits before tax, profits after tax and profits as a percentage of net worth.

5:9.1 PROFIT BEFORE TAX:

Profits before tax shows declining trend in the period 1950-51 to 1955-56 from Rs. 589 lakhs to Rs. 237 lakhs. It has decreased in the early two years in the second series i.e. from 1958-56 to 1960-'61 and thereafter it has increased. It has increased in the third series also.

5:9.2 Profits after tax have shown a declining tendency through out the period of analysis in the first series and have increased in the second. The third series of data shows that there has been huge profits in 1962-'63.

5:9.3 Profit after tax as percentage of net worth has decreased from 9.2 to 3.6 from 1950-'51 to 1955-'56. It was lowest, 2.5 in 1952-'53 and highest, 12.9 in 1951-'52. In the second series, it shows an increasing tendency, where as in the third series it has first decreased and then increased.

CONCLUSION:

In the end it can be concluded that: ~~there is a strong~~

(a) there is a strong correlation between total value added and wages paid to the workers. (see the definition of workers and wages from statistical appendix of Census of Manufacturers). In other words production in Jute Industry much more depends on the wages paid to workers (Vide 5:6)

(b) total earnings of the employees of the Jute Industry in the period 1950 to 1964 follows a parabolic trend given by

$$Y = 3.51 + 0.109\,t + 0.004\,t^2$$

which has an average trend of 0.109(yearly) and a positive acceleration of the order of 0.004. There is negligible amount of error in the series. (Vide Section 5:4)

(c) Total wage bills do not bear a linear relationship with value added. If it bears, it must have arisen due to chance only.

(d) the multiple correlation co-efficient is highly significant. Hence, considered together the consumers price-index number and productivity, satisfactorily explain the total earnings of the employees of Jute Textile Industry. (Vide Section 5:6)

(d) However, Consumers Price Index number satisfactorily explains after the elimination of productivity effect ($b_{y1.2}$) the total earnings of the employees of the Jute Mills. Productivity, after elimination of the effect Consumers Price Index number does not explains the total earnings of the workers(as $b_{y2.1}$) is insignificant). (Vide Section 5:6)

(e) linear logarithmics regression does not support the thesis that production and productivity bear a positive correlationship in this industry as the size of establishment increases.(Vide Section 5:8)

It is interesting to study briefly the findings of the Jute Wage Boards. ((80)). Jute Board included three components, viz. (a) basic wage, (b) wage Board increment and (c) dearness allowance in the minimum wage of the employee. Jute Board has granted some

broad heads viz. profits before tax, profits after tax and profits as a percentage of net worth.

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(b) total earnings of the employees of the Jute Industry in the period 1950 to 1964 follows a parabolic trend given by

$$Y = 3.51 + 0.109\, t + 0.004\, t^2$$

which has an average trend of 0.109(yearly) and a positive acceleration of the order of 0.004. There is negligible amount of error in the series. (Vide Section 5:4)

(c) Total wage bills do not bear a linear relationship with value added. If it bears, it must have arisen due to chance only.

(d) the multiple correlation co-efficient is highly significant. Hence, considered together the consumers price-index number and productivity, satisfactorily explain the total earnings of the employees of Jute Textile Industry. (Vide Section 5:6)

(~~d~~) However, Consumers Price Index number satisfactorily explains after the elimination of productivity effect ($b_{y1.2}$) the total earnings of the employees of the Jute Mills. Productivity, after elimination of the effect Consumers Price Index number does not explains the total earnings of the workers(as $b_{y2.1}$) is insignificant). (Vide Section 5:6)

(e) linear logarithmics regression does not support the thesis that production and productivity bear a positive correlationship in this industry as the size of establishment increases.(Vide Section 5:8)

It is interesting to study briefly the findings of the Jute Wage Boards. ((80)). Jute Board included three components, viz. (a) basic wage, (b) wage Board increment and (c) dearness allowance in the minimum wage of the employee. Jute Board has granted some

increase in the basic pay of the unskilled workers and clerical staff for the West Bengal and outside the West Bengal. It was Rs. 10.34 to Rs. 14.00 and Rs. 14 to the unskilled workers and clerical and other staff for West Bengal respectively. This figure outside the West Bengal amounted to Rs.10.36 Rs. 14.08 and Rs. 27 to Rs.82 respectively for the worker unskilled and clerical and other staff.

Wage-differentials were supported by the Jute Board, though it has been narrowed.

Like other Textile Industries, Jute Board, while recommending the Wages of the employees of the Jute Industry considered the following important points:

(i) Industry's capacity to pay and needs of the industry,

(ii) Special features of an industry.

(iii) Statutory and Non-Statutory benefits,

(iv) Prevailing rates of wages.

(v) Requirements of Social Justice.

Apart from this, trade unions seems to be strong in this industry. Excepting Jute Board, none of the Boards seems to have "prevailing wage" in the determination of Wage structure.

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CHAPTER 6

SUGAR INDUSTRY

CHAPTER - 6

SUGAR INDUSTRY

6:1 INTRODUCTION

"India has been the home of Sugarcane. References to it are found in early Vedic Literature. The story goes that sugarcane was one of the luxuries provided by Vishwamitra to Trishanku in the special heaven created for him. Crystal sugar manufacture too seems to have started in India first. Records exist of Chinese visiting India to learn the art of Sugar making as far back as 610 A.D. Similarly, there are evidences to show that there has been export of Crystal Sugar from early times". ((70)).

While the manufacture of Crystal Sugar by the indigenous process dates to early times, the manufacture of Sugar by the modern vacuum-pan process began in the early parts of this century when for the first time a few factories were established employing this process. However, in the year 1929-30, there were only 29 vacuum-pan Sugar factories in India producing 89,800 tons of Sugar. From 29, in 1929-'30 and 31 in 1931-'32, the number of factories reached to 147, 180 and 200 at the end of First, Second and Third Five Year Plans.

Though export of India Sugar was initiated in 1957, we entered the world market in a regular way in 1962, after the promulgation of the Sugar Export Promotion Ordinance. The export of sugar was on an average to the tune of 2.75 lakh tonnes from 1961-'62 to 1966-'67. Thus, sugar has now become an important item on the exports list for earning foreign exchanges.

India haw also made remarkable advance in the field of Sugar Machinery manufacture in as much as within a very short period of less than a decade, about 90% of the requirement of a complete Sugar plant are being manufactured indigenously and further, the export of Sugar machinery his also begun.

The Sugar industry has been operating under highly regulated condition out of the past 10 years, for as many as 7 years, there has been complete control on the industry. It will, therefore, be no exaggeration to say that Governments's policy is basically one of maintaining complete control on Sugar. Similarly, on the other side, for the development of the sugar factories, Sugar Co-operatives are seen in abudance. ((8)).

Apart from all these, there are certain very special features of the sugar industry. It is an agro-based industry, depending upon the Monsoon, Soil and Method of Cropping etc., The so called manufacturing plant, is, in fact, merely an extracting unit of Sucrose which is contained in the cane. The cane cost forms about the two third of the total manufacturing cost (excluding taxes) and the position has been about the same through the course of decades. Sugar factories besides being seasonal in character, have to be located in close proximity of the area of raw material supply, because a delay of even 24 hours has adverse effect on Sugar recovery.

In India, theme are three main industries completing for sugarcane consumption, viz., the white sugar, Gur, and Khandsari industries. There is considerable and almost cyclic variation in Sugarcane production resulting from climatic factors, such as, rainfall, floods or drought and incidence of plant diseases

to suffer more because of control than due to other competing industries, viz., Gur and Khandsari. Sometimes during years of cane shortage, being starved of cane, the factories are obliged to close some times at the highest recovery period. In such years the period of employment to the seasonal workers too is short and the cost of production for unit is extremely high.

The Committee on Rehabilitation and Modernization of Uneconomic (Sugar) Units in India has observed that at present the two main characteristics of Sugar manufacture in India are:

(a) Fluctuations in production, and

(b) High cost of production.

The development of Co-operative Sectors in the Sub-tropical Regions of U.P. and Bihar immediate post-protection period is also a sign of the fast-developing nature of industry.

High cost of production and insufficient utilization of existing capacity in the tropical region are due to the static nature of the yield per acre and sucrose content. Further, with the recent introduction of certain high yielding and early mathiing hybrid varieties of wheat and rice, cane cultivation is becoming less and less competitive. Obviously, it also leads to greater pressure for realization of high prices.

The economic features of the sugar industry present a picture of highly fluctuating fortunes. Sugar has been a highly controlled industry. The licensing of capacity in different regions as well as of the individual units is controlled under the industries (Development and Regulation) Act 1951. The Sugar prices during the controlled periods are fixed by the Government

on the basis of cost schedule worked out earlier by the Tarriff Commission and since 1965 by the Sugar Enquiry Commission. Duri periods of decontrols the prices are controlled by the system o monthly releases of Sugar by the Govt. From the year 1958-'5 to 1966-'67, there have been controls on Sugar with the exceptio of two years 1961-'62 and 1962-'63.

Besides the localisation of the Sugar Industry in India has also been defective. About 57 percent production of Sugar is from North India, while this sector of the country does not possess the suitable climate and soil as compared with South India. Similarly, good quality of Sugar cane are not grown in the country.

On the side of the factories, there is urgent need for rehabilitation and modernization of plants and expansion of units, which are uneconomic.

Control wage Board for Sugar appointed by Government of India, has also studied the problem of Sugar industry. The First Sugar Board(appointed on 26th Decr., 1957) has studied the problems in three parts:

(a) Wages;

(b) Conditions of employment;

(c) Fringe benefits such as gratuity and bonus.

The Board was of the opinion that there must be regional wage-differentials and on that ground recommended the minimum wages for unskilled workers for each region separately as follows:

	REGION *		Total Minimum Wages
1)	Central	.	Rs. 66 - 1 - 71
2)	North	..	Rs. 76 - 1 - 81
3)	Maharashtra	..	Rs. 87 - 1 - 92
4)	South	..	Rs. 81 - 1 - 86

The total minimum wages suggested by the Boards were related to 123 points of the All India Consumers Price Index.

Besides,the minimum wages of unskilled workers, the Board recommended a comprehensive wage-structure comprising 8 basis Wage scales for operatives (inclusive of unskilled workers), 6 for clerks and 4 for Supersory employees.((2)). Interplant and cadre wage differentials have also been maintained. A Scheme of gratuity and bonus has been suggested by the Board. The Second Wage Board was appointed on 16th Novr.,1965. One of the most important achievements of the First Wage Board is that it conducted investigations into job contents and nomenclature through its sub-committees and based its wage - structure on its findings.

6:2 Employment Structure:

It is obvious that the Sugar industry develops in the agriculture sector of the country. Since, it must for only

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'*' The areas included in each region are as follows:

(a) Central Region — Gujrat,Rajasthan, M.P. & Ori
(b) North Region — Punjab, U.P.,Bihar, W.B.,As
(c) Maharashtra -"— Maharashtra only.
(d) South Region — Madras, A.P., Kerla, Mysor

6 to 9 months in a year, it is bound to cause seasonal unemploy ment. A more clear and comprehensive picture may be given on the basis of the study of occupational wage survey 1958-'59.((7:

The estimated number of workers employed in Sugar Industr was 1.11 lakhs, of which 60 thousands were employed in U.P., about 18 thousands in Bihar, and 33 thousands in Rest of the Centres.

The entire working force was employed in 92 occupations, from which 50 occupations accounting for about 95 percent of the total estimated employment in the industry were selected for detailed analysis. The occupations mazdoors, the Centrifugal Mazdoors, and the Mill/Boiler Mazdoors were numerically the most important occupations accounting for nearly 59 percent of the total employment in the industry as a whole. No child workers was employed in the industry. Women workers were very few. These were employed in only one occupations of the Residual Stratum.

The time-rated system of payment was most frequent and the workers were mostly paid monthly or fortnightly. Very few workers in Utter Pradesh were being paid daily. Piecerated system of payment was only in a few occupations.

Coming to the census of manufacturers and the Annual Survey of India data, employment increased in the period 1950 to 1964.

6:3.1 WAGE STRUCTURE: (Vide Table 6:1)

It is interesting to study the wage-structure, present in the Sugar Industry of India, of the 10 selected occupations.

viz., (a) Pan Attendant, (b) Mill House Incharge, (c) Fitter (d) Quadruple man, (e) Fireman water attendant, (f) Engine Driver, (g) Mill Khalasi, (h) Mazdoor, (i) Centrifugal mazdoor. One of the main justifications is that they represent all groups of workers -- highly skilled, skilled, semi-skilled and unskilled, which will make a comparative study of wages of these occupations at different centres easy. (See Table No.1 on next page).

6:3.2 WAGE RATES:

The average minimum and maximum daily wage rates in the industry were quite low, viz., Rs. 2.31 and Rs. 2.74 respectively taking all the occupations together. The corresponding figures for Uttar Pradesh, Bihar and Residual stratum were Rs.2.24 and Rs. 2.61; Rs. 2.33 and Rs. 2.53; and Rs. 2.47 and Rs. 3.08 respectively.

As for the selected occupations, amongst the occupations common in all the strata the average minimum and maximum wage rates were the highest for the occupation, Pan Man in all the strata and lowest for the occupation, mazdoor and Mill/Boiler Mazdoor, with the single exception of Pattewala which was only found in Uttar Pradesh stratum. The average minimum wage rates for most of the occupations which accounted for a large majority of the workers varied between Rs. 2.01 to Rs.3.00. These wage rates were found to be slightly higher for a large number of selected occupations accounting for a larger proportion of workers in residual stratum than in the other two strata.

6:3.3: DEARNESS ALLOWANCE:

About 23 percent of the establishments were found to pay

separate dearness allowance and about 31.1 percent of the workers were receiving such allowance separately in the industry as a whole. The figures for the three strata-Uttar Pradesh, Bihar and Residual were 3 percent, 5 percent, 12 percent, sixtee percent, eightyone percent and Eightysix percent respectively. To all the worker receiving the allowance in Uttar Pradesh and Bihar, it was paid according to income groups; 25 percent linked to consumer prices index number and 23 percent at flat rate. Only in the Residual stratum about 3 percent of those workers who were in receipt of dearness allowance got it according to some other systems.

The average per capita earnings of the workers in the sugar industry was Rs. 2.28 per day. It was Rs. 2.05 per day in Bihar, Rs. 2.13 per day in Uttar Pradesh and Rs. 2.69 per day in Residual stratum. Among the selected occupations, earnings of workers in the occupation, Pan Man, were the highest in all the strata, (See N.C.A.E.R. study also in the next section). The Pattewala was the lowest paid occupation, which featured in Uttar Pradesh. The sweeper, the mazdoor, the motor man and the Mill Boiler Mazdoor were the lowest paid occupations in Bihar and the Dyer Mali in the Residual stratum.

Basic earnings (including dearness allowance)constitute practically whole of the worker's earnings in all the strata varying from 97 percent of total earning in the Residual stratum to 100 percent in Bihar. No production or incentive bonus was found to be paid in any of the strata.

Except for the occupation of palledar in the Residual stratum, earnings of both the time-rates and piece-rated workers

palledar in the Residual stratum was on account of regional differences.

Average earnings of workers were the lowest in Bihar and the highest in Residual statum. The average earnings of 73 percent of the workers in Bihar did not exceed Rs.2.00 per day, and of another 22 per cent varies between Rs. 2.01 to Rs.3.00 per day; in Uttar Pradesh average earnings of 61 percent of the workers did not exceed Rs. 2.00 per day and of an other 33 percent varied between Rs. 2.00 to Rs. 3.00 per day; and in the Residual stratum average earnings of 79 percent of the workers exceeded Rs. 2.00 per day and of 20 percent exceeded Rs. 3.00 per day.

Earnings of the first 50 percent of the workers did not exceed Rs. 1.95 per day in U.P., Rs. 1.92 in Bihar and Rs.2.44 in the Residual stratum. Those of the middle 50 percent varied between Rs. 1.84 and Rs. 2.25 in U.P., Rs. 1.83 and Rs. 2.05 in Bihar and Rs. 2.05 and Rs. 2.90 in Residual stratum.

Overtime working was not generally practiced in the Sugar industry. It was found to be resorted to in about 30 percent of the establishments in U.P., 25 percent in Bihar, and 50 percent in the Residual Stratum. The average earnings per hours from over time work was Rs. 0.63 in U.P., Rs. 0.76 in Bihar and Rs. 0.84 in Residual stratum

From the following table No.2 it is evident that out of 10 occupations in about 5 of them, the gap in the wages(maximum) paid by the lowest and highest wage paying centres is widening. The differentials in wages paid remains the same for four occupations, while for one there is a narrowing down of the wage spread between the highest and lowest paying centres for wages

(maximum) as compared to the minimum.

TABLE TWO

RATIO OF WAGES OF THE LOWEST WAGE CENTRES TO THE HIGHEST

cupations	Pan Attendant	Mill House Incharge	Fitter	Quadruple man	Fireman & Water Attdt.
	2	3=	4	5	6
ximum	1:.1.2	1:1.1	1: 1.3	1: 1.4	1: 1.3
nimum	1:1.2	1:1.2	1: 1.2	1: 1.1	1: 1.2
upations	Engine Driver	Mill Khalasi	Other	Mazdoor	Centrifugal Mazdoor
	7	8	9	10	11
imum	1: 1.2	1: 1.1	1: 1.3	1: 1.1	1: 1.3
imum	1: 1.2	1: 1.1	1: 1.3	1: 1.4	1: 1.3

Source: ((10)) Page 87

It is obvious from the above table that wage differentials in both minimum and maximum wages for the same occupations are very low, which may be said to be negligible, if not, it will not be only because ~~gronnets~~ of difference in location, absence of standardised job nomenclatures and cost of living index.

Uptil now our study was confined to the wage differentials of the same occupational wage group in the different centres. Now it will be rather essential to the study the wages of different occupations in the same centre.

The data regarding wage spread between the lowest and the highest paid jobs in the same centres are brought out in the following table: 3.

TABLE THREE

RATIOS OF WAGES OF THE LOWEST TO THE HIGHEST PAID JOBS

Minimum	Industry as a whole	Bihar	UTTAR PRADESH	Residual
L : H	1: 2.4	1:2.5	1:2.3	1: 2.6

Maximum

Without any exception, the highest paid job gets more than double the wage(minimum) of the lowest paid job in each of the four centres we have in our study. Excepting for very minor variations, the ratio of the lowest to the highest wage (minimum) in the different centres are more or less the same.

Same is the case with regard to maximum wages wherein also by and large similar wage differentials are maintained by the different centres between their lowest and highest paid occupations. But as compared to the minimum wages, in the case of maximum wages, the wage differentials between the lowest and the highest paid occupation in each of these four centres is greater. The highest paid job gets more than three times the wages of the lowest paid one (See also table 28)((10))

It is obvious from the above studies of wage-structure, that wages and earnings in U.P. and Bihar are lower than other regions. The explanation that may offered can only be of a tentative nature. It is because of the fact that the informations for newer and low paying plants are rarely found. Secondly, Maharashtra enjoys certain natural, climatic and economic advantages. The yield of cane is higher and its quantity is much better than elsewhere and much superior to U.P. and Bihar, which can be seen by the value added per capita.

The regional differentials are also due to the conditions demand of labour and supply of labour. The demand of labour is governed by its productivity and the capacity of an industry to pay - on its profitability. The supply side is influenced by the Cost of living also.

Uptil now we have studied the problems, characteristics and employment and wage-structures of the Sugar industry theoretically. In the coming section, an attempt has been made to study these problems statistically.

<u>6:4</u> <u>AVERAGE YEARLY EARNINGS:</u> (1950 - 1964)

An attempt has been made to calculate average yearly earnings'trend in regard to the employees of the Sugar Industry

during 1950-'64.

It is preferred to fit a parabolic regression of the second degree, only because of the fact that the second difference of the dependent variable (y), defined as,

$$\Delta^2 y_i = \Delta y_i - \Delta y_{i-1}$$

is almost nearly constants and satisfied the conditions the line of best-fit. This is shown in the following Table:

TABLE FOUR

Reference Table No.	Regression used	Regression Equation	Annual Rate	Residue
1.	2	3	4	5
6:6	Parabolic	$y = 2.38 + 0.16\,t + 0.015\,t^2$	2.66	0.31
	(Vide Figure 6:1)			

Source : Table 6:6

where y stands for average yearly earnings in terms of money of the persons employed in the Sugar Industry, t for time measured in years with reference to 1957 as origin.

Hence, we conclude that our parabolic regression shown by the equation -

$$y = 2.38 + 0.16\,t + 0.015\,t^2$$

represents the best-fit line with a positive acceleration and trend amounting 0.015 and 0.16 respectively.

GOODNESS OF FIT TEST:

It is worthwhile, to apply the Chi - squared test (i.e. χ^2 test), which is test of the agreement (or consistenc or confirmity) between a theoretical (hypothetical) and sample distribution. Karl Pearson's approximation, which is shown a

$$\chi^2 = \sum \left[\frac{(n_i - np_i)^2}{np_i} \right]$$

may be schematically as,

$$\chi^2 = \sum \left[\frac{(O_y - E_y)^2}{Ey} \right]$$

Where, O_y is the observed and E_y, expected frequency. As, it is clear, this χ^2 may be considered as a measure of discrepanc between O_y and E_y. If, there is no discrepancy, the $\chi^2 = 0$. Supplose our sample distribution agrees with the hypothetical (theoritical) distribution. In other words our null hypothesis is,

$$H_1 : O_y = E_y$$

The value of χ^2 by the χ^2-test is given by $\chi^2 = 0.122$ (vide table 6:6). The 5 percent critical value of $\chi^2 = 22.4$ corresponding to 13 degrees of freedom is greater than the computed value of $\chi^2 = 0.122$. The computed value of χ^2 does not ~~li~~ lie in between the 'rejection region', that is $\chi^2 \geq 22.4$.

CONCLUSIONS:

(a) Hence for 5 percent Level of significance our $\chi^2 = 0.122$ is not significant.

(b) So, our fit is good and there is a great agreement between observed and theoritical value of earnings of the employees of Sugar industry.

(c) In other words, our parabolic line,

$$y = 2.38 + 0.16\,t + 0.015\,t^2$$

is best fit line to the date of the table 6:6.

From the fig., 6:1 it is clear that fit is good and error terms which are caused by the internal and external fources is more or less nil.

6:8 RELATIONSHIP BETWEEN YEARLY WAGE BILLS AND YEARLY VALUE ADDED:

It is interesting to study the total yearly wage payments in relation of the total production in money terms(value added).

A linear regression of X (Wage Bill) on Y(value added) is calculated by the help of Least-Squared Method in table 6:7 which can be seen from the table given below:

TABLE FIVE

Reference Table No.	Regression Used	Regression Equation	Annual Rate	Residue
1	2	3	4	5
6:7	Linear	$X = 28.3 - 0.416Y$	13.7	400.73
		(Vide figure 6:2)		

Source:Table 6:7

The liner regression equation represents the best fit and the corresponding equation - is

$$X = 28.3 - 0.416\ Y$$

which explains X in terms of Y. The Co-efficient of regression is given by $b_{xy} = -0.416$.

It indicates the during 1950 - 1964, the wage bill shows an decreasing trend.

The significance of b_{xy} is tested by the t - test. The relevant value of t is given by

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6:8·1 RELATIONSHIP BETWEEN YEARLY WAGE BILLS AND YEARLY VALUE ADDED:

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which explains X in terms of Y. The Co-efficient of regression is given by $b_{xy} = -0.416$.

It indicates the during 1950 - 1964, the wage bill shows an decreasing trend.

The significance of b_{xy} is tested by the t - test. The relevant value of t is given by

$$t = (b_{xy} - \beta_{xy}) \sqrt{(n-2) \frac{\Sigma (Y-\bar{Y})^2}{\Sigma (X-\bar{X})^2}}$$

Assuming $\beta_{xy} = 0$ and substituting the values from table 6:7

$$t = -0.416 \sqrt{\frac{13 \times 1030.83}{400.74}}$$

$$= - 0.416 \times 5.75$$

$$= - 2.392 \quad \text{(Approximately)}$$

which is lesser than 5 percent critical value of $t = 1.771$ corresponding to 13 degrees of freedom. hence, we accept the null hypothesis and our empirical regression co-efficient $b_{xy} = - 0.416$ is insignificant. Therefore, there is sufficient reason not to believe that population exhibits a linear relationship between salaries and wages and value added. So increase in wages and salaries is merely due to sampling.

6:6 (ii) RELATIONSHIP BETWEEN YEARLY WAGE BILLS AND YEARLY VALUE ADDED" :

It is interesting to study the total yearly wage payments in relation of the total production in money terms (value added)

A linear regression of Y (value added) on X(Wage Bills) is calculated by the help of Least - squared method in table 6:7 which can be seen from the table given below:

TABLE SIX

Reference Table No.	Regression used	Regression Equation	Annual Rate	Residue
1	2	3	4	5
6:7	Linear	$Y = 18.21 + 1.175X$	34.34	1030.83
		(Vide Fig. 6:2)		

Source : Table 6:7

The linear regression equation represents the best fit and the corresponding equations is,

$$Y = 18.21 + 1.175\ X$$

which explains Y in terms of X, Y being the value added and the co-efficient of regression is given by, $b_{yx} = 1.175$.

It indicates that during 1950-1964, the value added shown an increasing trend rate.

The significance of b_{yx} is tested by the t -test.
The relevant value of t is given by,

$$t = (b_{yx} - \beta_{yx}) \sqrt{(n-2)\frac{\Sigma (X-\bar{X})^2}{\Sigma (Y-\bar{Y})^2}}$$

Assuming , $\beta_{yx} = 0$, and substituting the various values from table from 6.7

$$t = 1.175 \sqrt{\frac{13 \times 400.72}{1030.83}}$$

$$= 1.175 \times 2.23$$

$$= 2.64 \quad \text{(Ap roximately)}$$

which is greater than 5 percent critical value of of $t = 1.771$ corresponding to 13 degrees of freedom. Hence,we reject the null hypothesis and our empirical regression co-efficient

$b_{yx} = 1.175$ is sinificant. Therefore, there is sufficient reason to believe that population exhibits a linear relationship between salaries and wages and value added. So, increase in value added is not merely by chance.

6:7 CORRELATION BETWEEN WAGES OF WORKERS AND VALUE ADDED:

It has been attempted to calculate the Karl Pearson's correlation co-efficient between total value added (in million Rs.) and wages paid to the workers (in million Rs.) for a period of 15 Yrs from 1950-'64 by the following formula:

$$r = \frac{\Sigma xy - n\left(\frac{\Sigma x}{n}\right)\left(\frac{\Sigma y}{n}\right)}{n\sqrt{\left\{\left(\frac{\Sigma x^2}{n}\right) - \left(\frac{\Sigma x}{n}\right)^2\right\}\left\{\left(\frac{\Sigma y^2}{n}\right) - \left(\frac{\Sigma y}{n}\right)^2\right\}}}$$

On putting the various values from table 6:5, the valu of r is given by

$$r = \frac{17.52 - 15\ (-16.2/15)\ (6.4/15)}{15\sqrt{\left\{(121.36/15) - (-16.2/15)^2\right\}\left\{(13.92/15) - (6.4/15)^2\right\}}}$$

$= 0.674$ (Approximately).

It is worthwhile to test the significance of this correlation co-efficient to strengthen our statement. This can be tested by the use of t - distribution or by the use of null-hypothesis. Here, we will use both t-distribution test and sampling distribution test for r .

Significance of Correlation coefficient 'r'

(a) By using t distribution:

The value of t under the hypothetis that correlation co-efficient ρ in the population is zero, is given by

$$t = \frac{r}{\sqrt{\frac{(1-r^2)}{(n-2)}}}$$

which has t distribution with ϕ =(n-2) degree of freedom.

Putting the various values from table 6.5 the value of t is given by -

$$t = \frac{0.67}{\sqrt{\left(\frac{1-(.67)^2}{(15-2)}\right)}}$$

$= 0.67 / 0.21$
$= 3.36$ (Approximately

which is greater than the 5% critical value of t = 1.771 for (15.2) or 13 degrees of freedom. The computed value of t, therefore, does not lies in the "acceptance area" of the t distribution and we are inclined to reject the null hypothesis i.e. ρ = 0. Hence, the correlation co-efficient

$r = 0.67$, is significant at 5 percent level.

Therefore, there is a strong correlation between total value added and wages paid to the workers. It has not arised due to chance.

(b) <u>Use of Correlation Coefficient Table:</u>

When $\rho = 0$, we find an exact, sampling distribution of 'r', that is, symmetric around zero with a variance of 'r'

$$\text{Variance } (r) = \frac{1 - r^2}{\sqrt{(n-2)}}$$

A characteristic of the sampling distribution of 'r' is that it depends only on ρ and n. Since we have assumed $\rho = 0$ it means the sampling distribution for this case depends only on n. Hence, the probable vlues of 'r' will only depend upon the 'n'.

The probable value of 'r' for $\phi = n-2$ or (= 13) degrees of freedom at 5 percent level of significance is 0.5319, which is less than the calculated value of r. The computed value of 'r', therefore, does not lie in the 'acceptance area' i.e.

$P(-0.5319 > r > 0.5319) = 0.95$, of

of 'r' distribution and we are inclined to reject the hypothesi i.e. $\rho = 0$. Hence, corrdelation coefficient $r = 0.67$ is significant at 5 percent level.

<u>CONCLUSION</u>:

Therefofe, like t-test the significance of 'r' is strongly supported by the r - distribution test. In other words, the correlation between, value added and wages of the workers in the sugar industry is significant and it is not

$r = 0.67$, is significant at 5 percent level.

Therefore, there is a strong correlation between total value added and wages paid to the workers. It has not arised due to chance.

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of 'r' distribution and we are inclined to reject the hypothesi i.e. $\rho = 0$. Hence, correlation coefficient $r = 0.67$ is significant at 5 percent level.

CONCLUSION:

Therefofe, like t-test the significance of 'r' is strongly supported by the r - distribution test. In other words, the correlation between, value added and wages of the workers in the sugar industry is significant and it is not

merely by chance.

6:8 TOTAL AVERAGE YEARLY EARNINGS CONSUMER PRICE INDEX NUMBER AND PRODUCTIVITY (1951-'64)

A multiple linear regression of Y(indices of total yearly average earnings,base 1951), on X_1(consumers Price indices, base 1951) and X_2 (productivity Indices,base 1951) is caluulated by the help of least - squared method in table 6:8.

It comes out to be

$$Y = 0.58\ X_1 + 0.77\ X_2 - 0.372$$

According to the regression equation, the average yearly earning, (Y) increased on an average of 0.58 for each one unit of Consumers price index number (X_1). Similarly, the regression coefficient of X_2, which is 0.77 will increase the total earnings 0.77 times for every one percent increase in productivity. During the period of study, the productivity of the employees has been more effective in influencing in total yearly average earnings of the employees of Sugar industry as compared to the Consumers price index number. The partial regression co-efficient, by $b_{y1.2}$ and $b_{y2.1}$ are respectively given by 0.58 and 0.77. Their significance can be tested by the use of t - test.

Significance of $b_{y1.2}$:

The value of t of t-test is given by

$$t = (b_{y1.2} - \beta_{y1.2}) \sqrt{(n-k-1) \frac{\Sigma (X_1 - \overline{X}_1)^2}{\Sigma (Y_1 - \overline{Y}_1)^2}}$$

where $\beta_{y1.2}$ is the corresponding partial regression co-efficie in the population from which the regression data have been drawn We shall test the hypothesis that a change in X_1 in the population does not produce any change in the earnings of the employees. Therefore, the value of the t of the t-test is given by

$$t = b_{y1.2} \sqrt{\frac{(n-k-1) \quad \Sigma (X_1 - \overline{X_1})^2}{\Sigma (Y - \overline{Y})^2}}$$

where, n = total number of observations,

k = number of coefficients to be determined,

(n-k-1) = number of degrees of freedom,

Putting the various values from tables 6.8, the value of t of the t-test is given by

$$t = 0.58 \sqrt{(11 \times 0.32) / 2.08}$$

$$= 0.58 \times 1.3$$

$$= 0.754 \text{ (Approximately)}$$

which is lesser than the 5 percent critical value of t = 1.796 for 11 degrees of freedom. The computed value of t, therefore does not lie in the "rejection region" of the t-distribution and we are inclined to accept the hypothesis $\beta_{y1.2} = 0$. The change in the average yearly earnings of the employees of the sugar industry as a result of unit change in consumer price index, shown by the regression equation is merely due to chance.

<u>Significance of</u> $b_{y2.1}$

The value of t, under the hypothesis that corresponding partial regression coefficient $\beta_{y2.1}$, in the population is zero, is given by

$$t = b_{y2.1}\sqrt{\frac{(n-k-1)\ \Sigma\,(X_2 - \overline{X}_2)^2}{\Sigma\,(Y - \overline{Y})^2}}$$

where n and k have there usual meanings.

Putting the various values from table 6:8, the value of t is given by

$$t = 0.77\sqrt{(11 \times 1.89) / 2.08}$$

$$= 0.77 \times 3.15$$

$$= 2.426 \quad \text{(Approximately)}$$

which is greater than the 5 percent critical value of (t) = 1.796 for 11 degrees of freedom. The computed value of t, therefore, does not lies in the "acceptance area" of the t - distribution and we are inclined to reject the null hypothesis, that is $\beta_{y2.1} = 0$. So our regression coefficient is significant. The change in the average yearly earnings of sugar industry, as a result of unit change in the productivity indices, shown by regression equation, is not due to chance.

<u>COEFFICIENT OF MULTIPLE CORRELATION</u> $R^2_{y.12}$

The co-efficient of multiple correlation between the average yearly earnings of the employees of Sugar Industry (Y) on the one hand and consumers price index number(X_1) and productivity indices (X_2) on the other is found to study the combined importance of latter to the former.

It is given by

$$R^2_{Y.12} = \frac{\Sigma (Y' - \bar{Y})^2}{\Sigma (Y - \bar{Y})^2}$$

Where, Y' is the calculated value of the corresponding X_1 and X_2.

Putting the various values from table 6:8 the value of $R^2_{Y.12}$ is given by

$$R^2_{Y.12} = \frac{1.65}{2.08}$$

$$= 0.793 \text{ (Approximately)}$$

The square of the multiple corre lation co-efficient (also known as co-efficient of determination ((38))).

indicates that about 79.3 percent of the variation in the average yearly earnings of Sugar industry (y) is determined by the consumer price index number (X_1) and productivity(X_2). The remaining 20.7 percent of the variation in y remains unexplained and is determined by certain other factors like, favourable or unfavourable mansoon, diseases in the sugarcane crops, taxes levied upon the mills, size of establishments No. of working days in the factory.

Significance of $R^2_{Y.12}$

In order to verify of this conclusion is also true about the population, from which the regression data are drawn, the significance of $R^2_{Y.12}$ is tested by the help of F-test. The relevant value of of F of the F-test is given by

$$F = \frac{\text{Variance explained by the Regression Equation}}{\text{Residue Variance}}$$

for K and (n - k - 1) degree of freedom where K, is the number of variables eliminated. The hypothesis being tested is that $\rho_{y.12} = 0$ where $\rho_{y.12}$ is the coefficient of multiple correlation in the population.

The following table gives the familiar break-up summary of variance.

Table Seven

Analysis of variance Summary for the observed regression on data

...rce of ...iation	Sum of squares	Degrees of Freedom	Mean square
	2.	3	4
...al	$\Sigma(Y-\bar{Y})^2 = 2.08$	$(n-1) = 13$	$\Sigma(Y'-\bar{Y})^2/K = 1.65/2 = 0.825$
...ear ...ression	$\Sigma(Y'-\bar{Y})^2 = 1.65$	$K = 2$	
...idue ...n ...ression	$\Sigma(Y-Y')^2 = 0.26$	$(n-k-1) = 11$	$\dfrac{\Sigma(Y-Y')^2}{n-k-1} = \dfrac{0.26}{11} = 0.023$

Source:Table 6.8

Therefore, the value of the F of the F-test is given by,

$$F = \frac{0.825}{0.023} = 35.87 \text{ (Approximately)}$$

which is greater than the 5 percent critical value of F = 3.98 corresponding to 2 and 11 degrees of freedom. The F ratio is significant. The computed value of F = 35.87 lies in the "rejection region" of the F-distribution. The hypothesis $\rho_{y.12}$ is therefore rejected. This means that in the population, the variance in the total average ~~eque~~ yearly earnings (y) is accounted for by linear regression on consumer price index numbe... (X_2) and the productivity index(X_2). The conclusion about $R_{y.12}$ is therefore, strengthened and is not due to chance.

6.9 SIZE OF ESTABLISHMENT, PRODUCTIVE CAPITAL, WAGES AND PRODUCTIVITY:

Sugar industry which is agrarian in nature, also confirms the hypothesis that capital requirements per worker increa with the size of establishments. If, we analyse the tabl 6.10 carefully, it is clear that the requirement of productivity capital per person with an exception of group (50-99) increases from Rs. 5083/- to Rs. 12175/- and Rs. 31120/- and Rs. 17,795/- in the establishment groups 20-49, 100-249, and 250-499 from that of the group below 20. Thereafter, it increases with slower speed. It is only because of the fact that smaller units are less equipped and requires lesser machines etc., The productive capital requirements is smaller in the small units. The statement is also confirmed with the data of consumed fuels, power etc.,, The fuel and power has been more consumed by larger establishments than smaller units, proving thereby, that requirement of productive capital per person increases with the size of establishments.

Now for the verification of the relationship of the wages with labour productivity in regard to the size of establishment, an attempt has been made to calculate a linear logarithmic regression of the production(value added,Y). on productivity(X, defined as P/W, where P is production, and W is number of wage earners), by method of least squared in table 6:9

The summary of the analysis taste is given below:

eference able	Regression used	Regression '*' Equation	Rate of change according to size of establishment	Residue
	2	3	4	5
:9 :10	Linear Logrithmic Regression	Y = 2.26 X -0.0148 (Vide Fig., 6:3)	5.11	148.09

Source: Table 6:9, 6:10. '*' X = Log P/W, Y = Log P.

Liner regression shown by e the equation
Log P = 2.26 Log P/W - 0.0148
represents the best fit line.

It is worthwhile to apply the t-test to test the significan of b - the least squared regression coefficient as obtained by th best fit regression equation. Suppose β is the hypothetical population regression equation co-efficient. By supposing β = o, we may test the hypothesis that, in the population, the regression coefficient is zero. This means that there is no relationship between Log P and Log P/W (i.e.,Y & X) in the population.

The value of t of the t-distribution is given by,

$$t = (b - \beta)\sqrt{\frac{(n-2)\ \Sigma(X-\overline{X})^2}{\Sigma\ (Y-\overline{Y})^2}}$$

The quantity t follows the so-called t distribution with (n - 2) degrees of freedom, n being the number of observation because two constants have been eliminated from the data.

Therefore, on putting the various values from table 6:9 and 6:10 the value of t is given by

$$t = 2.262\sqrt{(8-2)\ x22.84\ /\ 148.09}$$

$$= 2.262 \times 0.95$$

$$= 2.1489 \text{ (Approximately)}$$

which is greater than the 5 percent critical value of t = 1.943 corresponding to 6 degrees of freedom. Hence, we reject the null hypothesis and our empirical regression coefficient b = 2.262 is significant. It is concluded, therefore, that our conclusion regarding labour productivity and production is supported statistically also.

6:10 PROFIT

Like other industries profits of this industry has been studied on the basis of studies of Reserve Bank of India((77)). It has been studied under several heads, like, profits before tax, profits after tax, profits as a percentage of net-worth etc., for the whole period of 1950-to-1964

6:10.1 PROFITS BEFORE TAX:

There is an increasing trend upto 1960-'61 from 1950-51 in the case of profits before ~~the~~ tax considering all the three parts of studies as one. It shows a declining trend in the third series from 1960-'61 to 1962-'63. In the case of Ist Series the profits before tax have doubled from Rs.2981lakhs to Rs. 6121/- lakhs in the period 195 -'51 to 1955-56. Similar is the case of Second series i.e. from 1955-56 to 1960-'61

6:10.2 PROFITS AFTER TAX:

Profits after the tax follow the same trend as is shown by profits before tax. These have increased in both the series i.e. from 1950-'51 to 1955-'56 and from 1955-56 to 1960-'61. (amount being Rs. 193/- lakh to Rs. 332 lakhs and Rs. 287 lakhs to Rs. 584 lakhs) respectively.

In the case of the third series there has been decrease from Rs. 584 lakhs to Rs. 192 lakhs in the year 1960-'61 to 1962-63 respectively. It may be due to the increasing tenden of heavy taxation found in the industry.

6:10.3 PROFITS AFTER TAX AS A PERCENTAGE OF NETWORTH:

This percentage also shows an increasing trend in the first two serieses i.e. in 1950-'51 to 1955-'56 and 1955-'56 to 1960 to 1961 and decreasing in the case of 3rd series i.e. from 1960-61 to 1962-'63. The highest and lowest percentage was 11.8, 11.9, 11.2 and 7.5, 7.9 and 3.5 in the three series respectively.

6.11 CONCLUSIONS:

It may be concluded that:

(a) there is a strong correlation between total value added and wages paid to the workers. It has not arisen due to chance.

(b) Average yearly earnings possess a parabolic trend with positive acceleration and trend amounting 0.10 0.015 and 0.16 per annum respectively.

(c) there is a linear relationship between salaries, and wages and value added. The regression co-efficient b = 1.175 is significant at 5 percent level.

(d) the partial regression co-efficient $b_{y1.2} = 0.58$ is insignificant. In other words, the change in the average earnings of the employees of the Sugar industry as a result of unit change in consumer price index, shown by the regression co-efficient, is due to chance only.

On the other hand, our partial regression co-efficient $b_{y2.1} = 0.77$ is significant at 5 percent level, proving thereby that the change in the productivity indices are not due to chance.

Taken together, 79.3 percent of the variations in the average yearly earnings of the sugar industry (Y) is explained by Consumer Price Index Number(X_1) and productivity index number (X_2). It has statistically been supported also, as co-efficient of multiple co-rrelation is significant (See section 6:8)

(e) The labour productivity and production bears a positive co-relation with respect of the size of establishment

Our regression coefficient b = 2.26 is significant at 5 percent level at significance.

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CHAPTER 7

MATCH INDUSTRY

CHAPTER+ 7

MATCH INDUSTRY

7:1 INTRODUCTION

The match factories in undivided India were very unevenly distributed. Accurate figures of the number of production units are not available as a large proportion of the industry is worked on a cottage industry basis. Even then the year 1945, India and Pakistan were having 127 and 6 factories with an employment of 17538 and 435, respectively. In the case of undivided India in 1945, there were total 133 factories employing 17973 persons. From the following table, location of match industry can be seen very easily:

TABLE ONE

LOCATION OF MATCH FACTORIES IN INDIA & PAKISTAN

		No.of Factories
India	...	36
Madras		11
West Bengal		8
Uttar Pradesh		4
Bombay		3
C.P.& Berar		2
Assam		2
Bihar		2
States		5
Pakistan		8
East Pakistan		4
West Pakistan		3
N.W.F.P.		1

Source: C.N.Vakil, pp 3 9(Economic Consequences of un Divided India) P.309

The leading producer in the match industry in WIMCO, a Swedish firm which has its branches in the prominent cities of India and also one branch at Lahore in West Pakistan.

According to the Census of manufacturers, which gives details of output for 64% of the match industry in India 12000 persons were working in the industry, which employed productive capital worth Rs. 2.11 Crores in 1947. The following were the chief raw materials consumed.

TABLE TWO

RAW MATERIALS CONSUMED IN THE MATCH INDUSTRY

Material	Unit	Quantity(In Thousands)
Wood	C.Fts.	3700 ½
Ammorphous Phosphets	Cwts.	1900
Chlorate of Potash	-"-	29000
Glue	-"-	7000
Parafin Wax	-"-	34000
Starch	-"-	26000

The total value of raw materials and chemicals was Rs.1.98 Crores the cost of wood being Rs.1.12 Cr., 19.6 million gross match boxes valued at Rs.4.7 Cr. were manufactured. ((80)). The value added by the manufacturers was Rs. 7 Crores, the contribution of Madras and West Bengal being Rs.74 lakhs and Rs.61 lakhs respectively.

A number of varieties of trees suitable for the manufacture of splints of boxes are found in India. In this connection the Tarriff Board remarked in 1928 that the factories in India were not properly located with regard to the economic utilisation of wood.

7:2 EMPLOYMENT STRUCTURE:

After independence, match industry progressed especially in plan periods, which can be seen from Table Three. As many as 54 factories were reported as registered in 1950 in which return giving factories were only 48, employing 238 persons per factory. An employment of 374 persons per factory was found when there were only 27 factories giving returns in 1953, which was minimum. More factories(56) were registered in 1964 with an employment of 231 persons per factory. Maximum employment of 408 per factory was seen in 1955, when there were only 42 factories giving returns. From 1950 to 1964 there were steady number of factories.

TABLE THREE

EMPLOYMENT STRUCTURE OF MATCH INDUSTRY IN THE PERIOD OF 1950 to 1964

EAR	No.of Factories giving Return	Total Employ-ment	Employ-ment / Factory	Men / Factory	Women / Factory	Chil-dren / Factory	No.of Days Work-ed
	2	3	4	5	6	7	8
950	48	12805	238	183	29	8	235
951	33	12163	265	262	36	14	237
952	28	12990	342	312	46	13	271
953	27	12709	374	327	41	8	238
954	40	15991	364	242	77	-	256
955	42	18334	408	229	91	26	276
956	40	16493	384	231	91	10	243
957	43	16765	357	207	86	10	266
958	36	14432	278	237	98	7	278
959	60	16104	252	N.A.	N.A.	N.A.	292
960	55	15628	285	163	80	5	298
961	48	14031	288	181	65	7	303
962	54	14303	266	177	64	2	298
963	50	12857	252	180	52	4	274
964	54	13046	231	164	54	5	280

<u>Source</u>: Table 7:2, 7:3

Total number of persons employed in this factory were 12805(Min.) 3335(Maximum) and 13046 in 1950, 1953 and 1964. Similarly for these ears 235, 276 and 280 days were working days. In these factories, a goo mber of women and children were employed. The maximum number of men r factory employed in this factory was in the year 1953 (327), whereas women (98) was in 1958 and of Children (26) was in 1955. Trend of men employment was in increasing fashion from 29 per factory in 1950 98 persons per factory in 1958 and declining onward till 54, in 1964.

Similarly child employment was also not preferred and in the plan periods this has been showing declining tendancy since 1955.

A€ the time of survey ((73)) during 1958-'59, the estimated total employment in the match factories was 33.7 thousands workers. The entire working force was categorised into 90 occupations. There were three occupations, viz. Box Filler, Box manufacturer and Frame Filler(Hand) which were numerically most important, employing more than 5000 workers each and which accounted for 67% of the total estimated employment.

As many as 60 occupations accounting for 3% of the total working force employed only upto 50 workers each. The 42 occupations selected for detailed study had 98 percent the workers in the industry. The percentage of men and women workers employed in this industry was 76 and 23 respectively. The proportion of child workers was negligible. In two important occupations, viz. "Box Manufacture" and 'Frame Filler(Hand)' no men were employed. Out of 99 selected occupations, 11 occupations are selected for detailed study. Critieria of selection is the number of employment and also the maximum and minimum wag s, which can be seen from the following Table 4, in which the number of Fitter was 264, where as that of Frame Fitters (Hand) was maximum, as much as 8416.

7:3 WAGE STRUCTURE:

Before the Minimum Wage Act of 1948, no standard wege rate was prescribed for these workers, working in the match industry. Rege Committee had worked in 1944, but it was just an observation. No proper and suitable prescribed wage rates were found in this industry.

TABLE FOUR

Wage Structure and Percapita Daily Earnings

...pations	Estimated number of workers	Average daily per capita earnings in (Rs.)			Percentage of		Average Daily	
		Basic Earnings	Productive or incentive Bonus	Total Daily earnings	Men	Women	Minimum wages (in Rs.)	Maxi-mum wage...
	2	3	4	5	6	7	8	9
...me Filler ...nd)	8416	3.11	0.13	3.24	-	97.9 2.1 c	2.62	3.24
...x Manufa-...urer	7553	0.77	-	0.77	2.2	97.3 .56 c	.30	1.63
...x filler	6581	0.69	-	0.69	2.0	97.3 0.7C	.34	2.07
...nd Roller	2959	0.85	-	0.85	88.8	2.2 [illegible].0C	0.65	1.13
...neral Asstt	1067	0.81	-	0.85	6.3	93.7	0.68	[illegible].98
...zdoor	1191	3.32	0.47	4.10	97.3	2.7	4.29	4.69
...cker	493	1.11	-	1.11	89.5	10.5	1.17	1.32
...erator Box ...l ing	358	3.74	0.31	4.24	90.3	9.7	1.65	2.34
...nd rolling ...ceiver	122	4.94	0.98	6.48	100.0	-	4.79	5.10
...tter	264	7.03	1.48	8.77	100.0	-	4.62	8.43
...eller	63	0.74	-	0.74	76.0	24.0C	0.69	0.78

Source Table 7:1 C = Children

Attendance Bonus was completely Nil in all the quotation occupations.

Only Mazdoor and Operator Box filling were getting Staff Allowance amounting Rs. 0.04 and 0.06 daily.

Except the occupation Fitter (Rs. 0.06 per day) no other occupations (selected) were getting overtime payment

There was complete time rated system of payment prevailed in the occupations - General Assistt., Mazdoor, Operator Box Filling and Fitter. Occupations frame filler (Hand) Box Manufacturer, Box Filler

7:3.1 REGIONAL DIFFERENTIALS:

Inspite of the promulgation of the Minimum Wage Act in 1948, there are several states, who have not paid even the basic minimum wage for their workers. No proper corrections have been made in the salary of these workers. The states differ in payment, which can be seen from the following Table No.5. Workers in the West Bengal State obtained Rs. 33/-p.m. which was maximum in all the states, in this industry. It was Assam which paid lowest minimum basic wage of Rs.20/- p.m. Uttar Pradesh is the Second lowest paying state paying Rs.26/- p.m. to the match factory workers.

7:3.2 DEARNESS ALLOWANCE:

Uttar Pradesh paid lowest dearness Rs.8/- p.m. whereas Bombay paid the highest Rs. 66/- p.m. to the workers of match industry. Madras paid Rs. 55/- (Second maximum) as Dearness allowance to the workers employed in this industry.

TABLE FIVE

TABLE SHOWING TOTAL EARNINGS OF WORKERS

Matches(1955)	Assam	W.B.	Bombay	Madras	U.P.
Minimum Basic Wage (Rs. P.M.)	20	33	28	29	26
Dearness Allowance(Rs.p.m.)	30	37	66	65	8
Total Earnings(Rs.p.m.)	50	70	94	84	34

Source: ((29)) pp 187, 188. Table 57.

Thus, it is Bombay, which paid maximum to its workers Rs.94/- p.m. followed by Madras which paid Rs. 84/- p.m. to its workers in this industry. All these studies have been made by the Ministry of labour, together known as occupational wage survey. ((73)).

Table No. 5a

ations	Estimated No. of Workers	Average Daily Per Capita Earning (in Rs.)					Average Daily	
		Basic Earn-ings	Shift Allow-ance	Over-time pay-ment	Others	Total.	Minimum Wage Rate	Maximu Wage Rate
	2	3	4	5	6	7	8	9
:tendant	2348	2.00	0.02	-	0.02	2.04	2.18	2.37
louse rge	535	4.91	0.01	0.13	0.13	5.18	4.40	6.71
:	1331	3.64	-	0.05	0.05	3.74	3.10	5.80
ıple man	340	2.94	0.01	0.03	0.04	3.02	2.78	3.74
ın Water lant	1230	2.39	0.01	0.01	0.04	2.45	2.32	2.72
Driver	3253	2.30	-	0.01	0.07	2.38	2.24	2.43
halasi	2439	2.22	-	0.02	0.03	2.27	2.22	2.66
	4259	2.0[illegible]	-	0.01	0.04	2.05	2.17	2.36
r	42396	1.99	-	-	0.06	2.00	2.11	2.37
fugal r	13288	1.97	-	-	0.05	2.02	2.66	3.16

Source: Table 6:1.

NB - <u>Production Bonus</u> was completely absent in allthe selected occupations.
<u>Attendance Bonus</u>: was also absent.
There was only Male persons employment in all the selected occupations.

Except Mazdoor, all the Nine occupations were being paid by time-rate system. In the case of Mazdoor 99 percent were paid Time rated system of payment, others by piece-rated system of payment.

TABLE SIX

CADRE DIFFERENTIALS

Year	Wages/ Workers	Wages/ Other Than Workers	Money Value of benefits and prévilages/ persons	Wages/Benefits as percentage of value added
1.	2.	3	4	5.
1950	987	2528	141	53
1951	1154	4616	145	62
1952	1125	2559	99	54
1953	1175	1208	141	54
1954	950	2645	110	53
1955	854	2752	42	64
1956	952	3372	56	52
1957	1142	2772	61	55
1958	1204	3780	69	44
1959	1152	3605	115	75
1960	1252	4255	115	54
1961	1474	4621	141	52
1962	1562	4913	182	54
1963	1700	4930	222	60
1964	1788	4668	235	63

Source: : Table 7:2, 7:3

NB: Figures are rounded.

7:3.3 SYSTEM OF PAYMENT:

The distribution of workers according to the system of payment, i.e. time rated and piece-rated, showed that 15 percent of workers were time rated and 85 percent were piece rated. As many as 69 percent of the workers in the industry were paid weekly. Payment of fortnightly and monthly intervals covered only 14 percent and 16 percent of the workers respectively. Only 32 percent of the working force was permanent, whereas 10.10 percent and 57.5 percent of the workers were engaged on temporary and casual basis.

7:3.4 OCCUPATIONAL WAGE DIFFERENTIALS:

The most common occupation in all the industries surveyed was that of mazdoor, with an estimated employment of 1191 and average daily per capita basic earnings of Rs.3.32. There were 99 occupations out of which, all occupations Frame Filler(hand), Box manufacturer, Box Filler have been selected for study. The criteria of selection are merely employment and basic earnings.

The majority of workers, i.e. 80 percent employed in 8 out of 42 selected occupations entered into employment at minimum wage rate of Rs. 1.00 per day per workers. The pay roll earnings of workers on an average in this industry was Rs.1.49 per day per worker. This constituted basic earnings (basic pay plus dearness allowance or consolidated wage(89 percent), production/incentive bonus 8 percent, bonus,shift allowance and overtime earnings B being negligible).

The table four shows the highest number of persons(8416) employed as Frame Filler (hand), who received an average daily per capita basic earnings of Rs. 3.11 and an incentive bonus of Rs. 13. In this occupation, Average daily minimum and maximum

wages were Rs. 2.62 and Rs. 3.24 per day respectively. The next type of occupation-Box manufacture (7553) received Rs. 0.77 basic salary with no other type of bonus. The maximum and minimum wages received by these type of workers was a Rs.1.68 and Rs. 0.30 per day. It were fitters (264) who obtained Rs.7.C per day as basic earnings. They obtained a total earning of (daily) Rs. 8.77. They obtained a maximum and minimum salary of Rs. 8.43 and Rs. 4.62 respectively where as leveller(63) obtained Rs. 0.74 per day. Their salary per day ranges between Rs. 0.69 and Rs. 0.78

DEARNESS ALLOWANCE:

Sixteen percent of the workers in the industry got dearness allowance and out of them 58% received it as linked to Consumers Price Index Numbers. ((73)).

BONUS AND OTHER ALLOWANCES:(VIDE TABLE 7:1)

The values of the lower and upper quartiles, medium and upper quartiles worked out to Rs. 0.42, Rs. 0.71 and Rs.1.16 respectively. The system of overtime working was found in 3 percent of the establishments in this industry employing 12 percent of the total strength, but the actual number of workers engaged on overtime accounted for 0.5 percent only in the industry. The estimated hourly overtime earnings of workers who worked overtime came to Rs. 1.17. It was only Fitters who obtain d Rs. 0.06 as overtime. No other occupation received this kind of overtime.

Production/Incentive bonus schemes were prevalent in 4 percent of the establishments in the industry and 12 percent of the workers were covered by these schemes. The average daily incentive earnings of workers were estimated at Rs. 4.05

It was fitters who obtained maximum daily incentive bonus amounting Rs. 1.48. Band saw man received the lowest incentive bonus of Rs. 0.80 per day.

Attendance bonus was received by only a few occupations like-operator continuous machine, operator packing machine and few others amounting Rs. 0.64, Rs. 0.06 etc., respectively.

Shift allowance was also obtain d by 10 percent to 18 percent of the workers. Sweepers obtained maximum amount of Rs. 15 ~~percent~~ per day

7:3.5 SEX DIFFERENTIALS:

In occupations like Frame Filler, Box manufacturer Box filler about 97.5 percent of the total workers were women, whose maximum and minimum wage ranged between Rs.3.24 to Rs. 0.30. Children were also (2 to 3 percent) employed in these factories, who obtained less than those of men and women employment. It was the occupation of the leveller in which 24 percent of the employed were children, receiving Rs. 0.69 to Rs. 0.78 per day.

7:3.6 CADRE DIFFERENTIALS:

From the above study of Occupational Wage Survey (1958-'59) we have seen a genuine picture of what prevailed at the time of survey. Now a different pattern of study will be adopted which wil be exclusively bas d on the different years Census of Manufacturing Industry ~~and~~ ((60)) and Annual Survey of Industries ((61)).

The whole of the employment is divided into two parts-one consisting of persons, who worked as worker, and an other of those who were not workers did not make any direct contribution to the production, but employed in ministerial staff,

to be known as other than workers.

As much as Rs. 1787.5 was the maximum yearly earnings received in 1964 by the workers whereas this figure was found to be Rs. 4930.00 in 1963 in the case of persons other than workers. The salaries yearly received by persons other than workers were approximately three times that of workers. Salaries and wages in both the cases show an increasing trend after independence and in the beginning of the first plan period. It was Rs. 987 and Rs. 2528 in 1950 received by workers and other than workers. Lowest yearly payment received by the workers was Rs. 854/- in 1955, whereas it was Rs. 1208 in 1953 received by persons other than workers. Money value of benefits and previlages inclusive of medical facilities, house and others, was maximum Rs. 2[illegible]5.5 in 1964 and minimum Rs. 42.4 in 1955, received by both type of workers and other than worker. This type of increase in Money value of benefits and privilages is only because of the Central Wage Boards efforts and awakening of the employees.

In 1950 it was 53 percent of value added paid in the form of wages and benefits. This percentage was highest-75 in 1959 and 63 in 1964.

Now it will be interesting to study statistically the relationship between wages of workers, other than workers and time, consumer price index number and productivity of the employees. Uptil now only theoritical study based on published data has been presented. Statistical tests have also been frequently used to verify the validity of the statements. Time series analysis, Karl Pearson's Corelation Coefficient, and Analysis of Variense are the main tools for analysis.

7:4 AVERAGE YEARLY EARNINGS: (1950-'64)

An attempt has been made to calculate average yearly earnings trends in regard to the employees of the match industry during 1950-'64.

It is preferred to fit a parabolic regression of the order of second degree, only because of the fact that the second difference of the dependant variable (Y), defined as,

$$\triangle^2 Yi = \triangle Y_i - \triangle Y_{i-1}$$

is almost nearly constant and satifies the conditions, for the line of best fit. This is shown in the following table

TABLE SEVEN

Reference Table No.	Regression Used	Regression Equation	Annual Rate	Residue
1.	2.	3	4	5
7:6	Parabolic	$Y = 4.46 + 0.26t + 0.021 t^2$	4.85	1.38

(Vide Fig. 7.1)

Source: Table 7:6

Where Y stands for average yearly earnings in terms of money of the persons employed in the match industry, t for time measured in years with reference to 1957 as origin.

Hence, we conclude that our parabolic regression shown by the equation

$$Y = 4.46 + 0.26\ t + 0.021\ t^2$$

represents the best fit line with a positive acceleration and trend amounting 0.021 and 0.26 respectively.

GOODNESS OF FITTEST:

It is worth while to apply the Chi-squared test(χ^2 -test)

which is test of the agreement (or consistency or confirmity) between a theoretical(hypothetical) and sample distribution. Karl Pearson's approximation which is shown as,

$$\chi^2 = \sum \frac{(n_i - np_i)^2}{np_i}$$

may be schematically as,

$$\chi^2 = \sum \frac{(O_y - E_y)^2}{E_y}$$

where, O_y is the observed and E_y, expected frequency. As it is clear, this χ^2 may be considered as a measure of discrepancy between O_y and E_y. If, there is no discrepancy, the $\chi^2 = 0$. Suppose our sample distribution agrees with the hypothetical (theoretical) distribution. In other words, our null hypothesis, is,

$$H_1 \; : \; O_y = E_y$$

The value of χ^2 of the χ^2 -test is given by $\chi^2 = 0.26$ (Vide table 7.6) . This critical value of $\chi^2 = 22.4$ corresponding to 13 degrees of freedom is greater than the computed value of $\chi^2 = 0.26$. The computed value of χ^2 does not lie in between the "rejection region" that is $\chi^2 \geqslant 22.4$

CONCLUSION:

(a) Hence χ^2 for 5 percent level of significance our $\chi^2 = 0.26$ is not significant

(b) So, our fit is good and there is a great agreement between observed and theoretical value of earnings of the employees of the match industry.

(c) In other words, our parabolic line

$Y = 4.96 + 0.26\,t + 0.021\,t^2$

is best fit line to the data of the table 7:6. From the Fig.7:1 it is clear that fit is good the error is more are less nill.

7:5.1 RELATION SHIP BETWEEN YEARLY WAGE BILLS AND YEARLY VALUE ADDED:

A linear regression of X (wages and Salaries) on Y (Value added) is calculated ~~by~~ by the help of least squared method in table 7.7 which can be seen from the table given below;

TABLE EIGHT

Reference Table No.	Regression used	Regression Equation	Annual Rate	Residue
1	2	3	4	5
7:7	Linear	$X = 0.49 + 0.43\ Y$	2.18	2.66
		(Vide Fig., 7.2)		

Source : Table 7.7

The linear regression equation represents the best fit and the corresponding equation is

$$X = 0.49 + 0.43\ Y$$

Which explains X in terms of Y, X being total wage bills, and the coefficient of regression is given by b $b_{xy} = 0.4$

It indicates that during 1950 - 1964 the wage bill shows an increasing trend rate.

The significance of b_{xy} is tested by the t-test. The relevant value of t is given by

$$t = (b_{xy} - \beta_{xy}) \Big/ \sqrt{(n-2) \quad \Sigma(Y - \bar{Y})^2 / \Sigma(X - \bar{X})^2}$$

Assuming $\beta_{xy} = 0$, and substituting the various values from table 7:7

$$t = 0.43 \sqrt{13 \times 9.71 / 2.66}$$
$$= 0.43 \times 6.89$$
$$= 2.9627 \text{ (A proximately)}$$

which is greater than the five percent critical value of $t=1.77$ corresponding to 13 degrees of freedom. Hence, we reject the null hypothesis and our empirical regression coefficient $b_{xy} = 0.43$ is significant. Therefore, there is sufficient reason to believe that population exhibits a linear relationship between salaries, wages and value added. So, increase in wages is not merely by chance.

7:5.2 RELATIONSHIP BETWEEN YEARLY WAGE BILLS AND YEARLY VALUE ADDED :

It is interesting to study the total yearly wage payments in relation of the total production in money terms (value added).

A linear regression of Y (value added in 10 thousand Rs.) on X (total wage bills) is calculated by the help of least-squared method in table 7:7, which can be seen from the table given below

TABLE NINE

Reference Table No.	Regression used	Regression Equation	Annual Rate	Residue
1	2	3	4	5
7.7	Linear	$Y = 1.523 X + 0.62$	3.9	9.71
		(Vide Figure 7:2)		

SOURCE TABLE 7:7

The linear regression equation represents the best fit and the corresponding equation is

$$Y = 1.523 X + 0.62$$

which explains Y in terms of X, Y being the value added and the co-efficient of regression is given by b = 1.523

It indicates that during 1950-1964, the value added shows an increasing trend rate.

The significance of b_{yx} is tested by the t-test. The relevant value of t is given by

$$t = (b_{yx} - \beta_{yx}) \sqrt{(n-2) \; \Sigma(X-\bar{X})^2 \; / \; \Sigma(Y-\bar{Y})^2}$$

Assuming $\beta_{yx} = 0$, and substituting the various values from table 7.7

$$t = 1.52 \sqrt{13 \times 2.66 \; / \; 9.71}$$

$$= 1.52 \times 1.85$$

$$= 2.812 \text{ (Approximately)}$$

which is greater than the 5 percent critical value of $t = 1.771$ corresponding to 13 degrees of freedom. Hence, we reject the null hypothesis and our empirical regression co-efficient $b_{yx} = 1.52$ is significant. Therefore, there is sufficient reason to believe that population exhibits a linear relationship between salaries and wages and value added. So increase in value added is not merely by chance.

7.6 CORRELATION BETWEEN WAGES OF WORKERS AND VALUE ADDED

It has been attempted to calculate the Karl Pearson's Correlation Co-efficient between total value added (in Million Rs.) and wages paid to the workers(in million Rs.) for a period of 15 years from 1950 to 1964 by following formula.

$$r = \frac{\Sigma xy - n \; (\Sigma x/n) \; (\Sigma y / n)}{n \sqrt{\left\{ (\Sigma x^2 /n) - (\Sigma x/n)^2 \right\} \left\{ (\Sigma y^2/n) - (\Sigma y/n)^2 \right\}}}$$

on putting the various values from table 7:5 the value of r is given by

$$r = \frac{3.34 - 15\,(-0.6/15)\,(-0.8/15)}{15\sqrt{\left\{1.54/15 - (-0.6/15)^2\right\}\left\{9.72/15-(0.8/15)^2\right\}}}$$

= 0.88 (Approximately)

It is worthwhile to test the significance of this correlation coefficient to strengthen our statement. This can be tested by the use of t - distribution or by the use of null hypothesis. Here, we will use both - t - distribution test and sampling distribution test for r.

Significance of Co-rrelation co-efficient 'r':

(i) By using - t - distribution:

The value of t under the hypothesis that correlation coefficient ρ in the population is zero, is given by,

$$t = r \Big/ \sqrt{(1 - r^2)/(n-2)}$$

which has t-distribution with $\phi = (n-2)$ degrees of freedom.

Putting the various values from table 6:5, the value of t is given by -

$$t = 0.88 \Big/ \sqrt{(1 - (0.88)^2)/(13)}$$

$$= 0.88 / 0.21$$

$$= 2.146$$

which is greater than 5 percent critical value of t = 1.7 for (15-2) or 13 degrees of freedom. The computed value of t, therefore, does not lie in the "acceptance area" of the t - distribution and we are inclined to reject the null hypothesis, that is, $\rho = 0$. Hence, the correlation co-efficient r = 0.88 is significant at 5 percent level.

Therefore there is a strong correlation between total value added and wages paid to the workers. It has not arisen due to chance.

(ii) USE OF CO-RRELATION CO-EFFICIENT TABLE:

where $\rho = 0$, we find an exact sampling distribution of 'r' that is, symmetric about zero with a variance r of,

$$\text{Variance } (r) = (1 - r^2) / \sqrt{(n-2)}$$

A characteristic of the sampling distribution of 'r' is that it depends only on ρ and n. Since we have assumed $\rho = 0$, it means the sampling distribution for this case depends only on 'n'. Hence, the probable values of 'r' will depend upon the 'n'. The probable value of 'r' for ϕ = n - 2 or (13) degrees of freedom at 5 percent level of significance is 0.5319, which is less than the calculated value of r. The computed value of 'r', therefore, does not lie in the "acceptance area", that is ($P(-0.5319 < r < 0.5319) = 0.95$, of r - distribution and we are inclined to reject the hypothesis that $\rho = 0$. Hence, correlation co-efficient r = 0.88 is significant at 5 percent level.

Therefore, like t - test the significance of r is strongly supported by r - distribution test. In other words, the correlation between value added and wages of the workers in the match industry is significant and is not merely due to chance.

7.8 TOTAL AVERAGE YEARLY EARNINGS, CONSUMERS' PRICE INDEX NUMBER AND PRODUCTIVITY (1951 - 1964)

A multiple linear regression of Y (indices of total yearly average earnings base 1951) On X_1 (CONSUMERS' PRICE INDEX NUMBE Base 1951) and X_2 (productivity indices base 1951) is calculated by the help of least-squared method in table 7.8

It comes out to be,

$$Y = 1.23\,X_1 + 0.47X_2 - 0.614$$

According to the regression equation, the average yearly earnings (Y) increased on an average of 1.23 for each unit of the consumer price index No.(X_1). On similar way the regression coefficient of X_2 which is 0.47 will increase the total earnings 0.47 times for every one percent increase in productivity. During the period of study, the productivity of the employees has been less effective the influencing the total yearly average earnings of the employees of match industry as compared to the consumers price index number. The partial regression co-efficient $b_{y1.2}$ and $b_{y\,2.1}$ are respectively given by 1.23 and 0.47. Their significance can be tested by the use of t - test.

SIGNIFICANCE OF $B_{y1.2}$

The value of t of the t - test is given by,

$$t = (b_{y1.2} - \beta_{y1.2}) \sqrt{(n-k-1)\,\Sigma(X_1 - \overline{X}_1)^2/\Sigma(Y - \overline{Y})^2}$$

Where $\beta_{y1.2}$ is the corresponding partical regression coefficient in the population from which the regression on data have been drawn. We shall test the hypothesis that a change in X, in the population does not produce any change in the earnings of the em loyees. Therefore, the value of t of the t test is given

$$t = b_{y1.2} \sqrt{(n-k-1)\,\Sigma(X_1 - \overline{X}_1)^2/\Sigma(Y - \overline{Y})^2}$$

where n = total number of observations,,

k,= number of coefficients to be determined,

(n-k-1) = the number of degree of freedom

Putting the various values from table 7.8 the value of t of t-test is given by

$$t = 1.23 \sqrt{11 \times 0.32 / 1.28}$$
$$= 1.23 \times 0.165$$
$$= 2.0295$$

which is greater than the 5 percent critical value of $t = 1.796$ for 11 degrees of freedom. The computed value of t, therefore, does not lie in the "acceptance area" of the t-distribution and we are inclined to reject the null-hypothesis, that is $\beta_{y1.2}=0$. So, our regression co-efficient is significant. The change in the average yearly earnings of the employees of the match industry as a result of unit change in Consumer Price Index, shown by the regression of equation is not due to chance.

<u>SIGNIFICANCE OF</u> $b_{y2.1}$ -

The value of t, under the hypothesis that corresponding partial regression co-efficient $\beta_{y2.1}$ in the population, is zero, is given by $t = b_{y2.1}$

$$t = b_{y2.1} \sqrt{(n-k-1) \quad \Sigma(X_2 - \overline{X}_2)^2 / \Sigma(Y - \overline{Y})^2}$$

where, n and k have their usual meanings. Putting the various values from Table 7:8, the value of t is given by

$$t = 0.47 \sqrt{11 \times 1.04 / 1.28}$$
$$= 0.47 \times 2.99$$
$$= 1.4056$$

which is lesser than 5 percent critical value of $t = 1.796$ for 11 degrees of freedom. The computed value of t, therefore, lies in the "acceptance area" of the t-distribution and we are inclined to accept the null hypothesis, that is $\beta_{y2.1} = 0$.

So our regression coefficient is insignificant. The change in the average yearly earnings of the matches industry, as a result of unit change in productivity indices, is merely due to chance

CO-EFFICIENT OF MULTIPLE CORRELATION $R_{y.12}$

The co-efficient of multiple correlation between the average yearly earnings of the employees of match industry(Y) on the one hand and consumers price index number(X_1), and productivity index Number (X_2) on the other, is found to study the combined importance of letter to the former.

It is given by

$$R^2_{y.12} = \sum_{=1}^{14}(Y' - \bar{Y})^2 \Big/ \sum_{=1}^{14}(Y - \bar{Y})^2$$

where, Y', is the calculated value of the corresponding X_1 and X_2 .

Putting the various name values from table 7:8 the value of $R^2_{y.12}$ is given by,

$$R^2_{y.12} = 1.03 / 1.28$$
$$= 0.804$$

The square of multiple correlation co-efficient (also known as co-efficient of determination) indicates that about 80.4 percent of the variation in average yearly earnings of match industry (Y) is determined by the Consumer Price Index number (X_1) and productivity Index number (X_2). The remaining 19.6 percent of the variation in Y remains unexplained and is determined by the certain other factors like technology, size of establishments, bargaining power etc.,

SIGNIFICANCE OF $R^2_{y.12}$

In order to verify if this conclusion is also true

the significance of $R^2y.12$ is tested by the help of F-test.

The relevant value of the F-Test is given by

$$F = \frac{\text{Variance Explained by the Regression on Equation}}{\text{Residue Variance}}$$

for k and (n - k - 1) degrees of freedom when K is the number of variables eliminated.

The hypothesis being tested is that $\rho = 0$, when $\rho_{y.12}$ is the coefficient of multiple correlation in the population.

TABLE TEN

THE FOLLOWING TABLE GIVES THE FAMILIAR BREAK-UP SUMMARY OF VARIANCE

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Square
1.	2	3	4
Total	$\sum_{=1}^{14} (Y - \bar{Y})^2 = 1.28$	$(n - 1) = 13$	$\sum_{=1}^{14} (Y' - \bar{Y})^2 / K$ $= 1.03/2$ $= 0.515$
Linear Regression	$\sum_{=1}^{14} (Y' - \bar{Y})^2 = 1.03$	$K = 2$	
Residue from Regression	$\sum_{=1}^{14} (Y - Y')^2 = 0.19$	$(n - k-1)$	$\sum_{=1}^{14} (Y - Y')^2/n-k-1$ $= 0.19/11$ $= 0.017$

Source Table 7.8

Therefore the value of F of the F-test is given by

$$F = \frac{0.515}{0.017}$$

$= 30.29$ (Approximately)

which is greater than the 5 percent critical value of $F = 3.98$, corresponding to 2 and 11 degrees of freedom. The F-ratio is significant. The computed value of $F = 30.29$ lies in the "rejection region" of the F-distribution. The hypothesis $\rho_{y.12}=0$ is therefore rejected. This means that in the population, the variance in the total average yearly earnings (Y) is accounted for by linear regression on Consumers Price Index number(X_1) and the productivity(X_2). The conclusion about $R^2_{y.12}$ is therefore strengthened, and is not due to chance.

7:8 SIZE OF ESTABLISHMENTS PRODUCTION CAPITAL WAGES AND PRODUCTIVITY:

The match industry which is more cottage and less mill industry shaow that production capital per person required by small size of establishment is higher than that of larger establishments. Upto the classification group 250-499 it has shown a declining tendency, after which it is increasing. So it will be ambiguous to comment anything regarding the relationship between the size of the establishments and the productive capital per person required.

Now in order to draw a clear result about the relationship of the wages with labour productivity in regard to the size of the establishments an attempt has been made to calculate a linear logarithmic regressions of the production(value added, Y) on productivity (X, defined as P/W, where P is production and W is number wage earners), by method of least-squared in table No.7.9. The summary of the analysis table is given below:-

TABLE ELEVEN

Reference Table	Regression Used	Regression'*' Equation	Rate of change according to size of establishments	Residue
1	2	3	4	5
7:9	Linear logarithmic Regression	Y = 1.588 X + 0.159	4.60	106.84

(Vide Fig., 7.3)

Source: Table 7:9, 7:10 '*' Y = Log P, X= Log P/W

Linear regression shown by equation

Log P = 1.588 log P/W + .159

represents the best fit line.

It is worth while to apply the t-test to test the significance of b—the least squared regression co-efficient as obtained by the best fit regression equation. Suppose β is the hypothetical population regression equation co-efficient. By supposing $\beta = 0$ we may test the hypothesis that, in the population the regression co-eficient is zero. This means that then is no relationship between log P and log P/W(i.e. Y LX) in the population.

The value of t of the t-distribution is given by

$$t = (b - \beta) \sqrt{(n-2)\Sigma(X - \bar{X})^2 / \Sigma(Y - \bar{Y})^2}$$

The quantity t follows the so called t-distribution with (n-2) degrees of freedom ~~is~~ n being the number of observations, because two constants have been eliminated for the data.

Therefore, on putting the various value from table 7.9, the value of t is given by

$$t = 1.588 \sqrt{(7-2)\ 21.18 / 106.84}$$
$$= 1.588 \times 0.99$$
$$= 1.572 \text{ (Approximately)}$$

which is lesser than 5 percent critical value of t = 2.015 corresponding to 5 degrees of freedom. Hence we accept the null hypothesis, and our empirical regression co-efficient b = 1.572 is insignificant (but significant at 10 percent level, t = 1.476). It is concluded, therefore, that our conclusion regarding labour productivity and production is not supported statistically.

7.9 PROFIT

Owing to the reason that the match industry was a small nature, industry no proper attention has been paid to control the industry. Profit data are not available for this industry except the study made by the Reserve Bank of India. Our study is based on that. The whole period has been studied in three series and three heads - Profits before tax, profit after tax and profit as a percentage of net worth ((77)).

7:9.1 PROFIT BEFORE TAX

Profits before tax in the case of match industry decreased by Rs. 2 lakhs in the first series from 1950 - '51 to 1955-56 increased by Rs. 54 lakhs in the second series 1955-'56 to 1960-'61 and also in the third series by Rs. 40 lakhs from 1960-'61 to 1962-'63 Except in the first series, it shows an increasing trend in the last the series (see Table 7:1.11, Statement 5:1A)

7:9.2 PROFITS AFTER TAX:

Profit after tax follows the same path as fol owed by the profits before tax, that is, it has decreased in the first series and increased in the second and third series of study. The loss in the period 1950-'51 to 1955-'56 and the profits in the periods 1955-'56 to 1960-'61 and 1960-'61 to 1962-'63 was of very small amount, proving there by that the tax was more or less constant.

7:9.3 PROFITS AFTER TAX AS A PERCENTAGE OF NET WORTH:

This percentage was highest 13.3 and lowest 9.6 in 1950-'51 and 1955-'56 in the first series; 21.9 and 10.5 in 1955-'56 and 1960-'61 in second series and 13.4. and 11.7 in 1962-'63 and 1961-'62 in the third series of study. It shows a cyclic trend taken all the 15 years of study.

7:10 CONCLUSION:

From the above study it can be safely concluded that:

(a) there is strong correlation ($r = 0.88$) between total value added and wages paid to the workers. It is statistically significant at 5 percent level(Vide Section 7.6).

(b) average yearly earnings possess a parabolic trend with positive acceleration and trend amounting 0.021 and 0.26 per annum (Vide Section 7.4).

(c) there is a linear relationship between salaries and wages and value added. This value added is explained by salaries and wages. The regression coefficient $b_{yx}=1.523$ is significant at 5 percent level(vide section 7:5.2)

(d) the partial regression coefficient $b_{y1.2} = 1.23$ is significant. In other words, the change in the average ye yearly earnings of the employees of the match industry

as a result of unit change in consumers price index, shown by the regression coefficient is not due to chance.

Similarly, our partial regression coefficient $b_{y2.1}=0.47$ is insignificant at 5 percent level, proving thereby that the change in the average yearly earnings of the match industry, as a result of unit change in productivity indices is merely due to chance.

Taken together, 8 .4% of the variations in the average yearly earnings of match industry (Y) is explained by consumers price index number (X_1) and productivity index number(X_2). It has stastically been supported also, as coefficient of multiple correlation is significant(Section ~~10~~. 7:7)

(e) the labour productivity and production bears a positive relationship with respect to that of size of establishment. Our regression coefficient is not significant at 5 percent level, but significant at 10 percent level. Apart from this if the industry is provided protection, it may develop very soon. Even since the pre-independence period, this industry has been in the nature of a cottage industry, towards which an attitude of neglect has always been maintained. It was also due to the unorganised nature of the industry. Labourers employed in this industr are low paid, unskill d and less efficient only because of the weak trade unions (i.e. weaker bargaining power), whereas average daily earning in this industry totally depends upon (i) trade unionism, (ii) gross profit and

productivity (iii) the ratio of wage costs to value added. These factors in the absence of complete data for trade unionism have been basically not considered.

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CHAPTER 8

PAPER AND PAPER BOARD INDUSTRY

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PAPER AND PAPER BOARDS INDUSTRY

8:1 INTRODUCTION

The beginning of paper industry in India dated back to 1832, when the first paper mill was established by Dr. Carey at Serampur in West Bengal. This venture, however, failed after a few years. Meanwhile in 1867, another paper mill, The Royal Paper Mill was established closed by at Bally and the machinery of Serampur mills was also transferred to this mill in 1870. Waste paper, rags and jute cuttings were used as raw materials. After more than one decade, another mills, the Upper India Coup r Mills, started operations at Lucknow in 1881. Closely following, in 1884, Titaghar Paper Mills, Calcutta came into existence. Both these mills extended the use of raw materials to "moonj" and "Sabai" grass. Soon, two more paper mills were set up-the Deccan Paper Mill at Poona in 1887 and the Bengal Paper mill at Raniganj in 1889. These two mills were running under the shortage of raw materials or imported pulp.

A slight progress in the paper production was seen in First World War period due to the use of bamboo as raw materials. It could not continue for a long period. But in the Post-War years, due to the severe foreign competition and general market recession, the industry suffered a heavy set back and had to struggle for its very existence.

But, in 1925 the Government gave protection to those mills which were using bamboo as raw material, under the Bamboo Paper Industry Act 1925 for seven years. This protection was again extended for another seven years in 1931. On the recommen-

dations of the Tarrif Board, the protection given to the mills was taken back in 1947. Due to the these protections, the paper industry progressed leaps and bounds. By 1950, the production has almost doubled and reached to 108912 tonnes, to that of the production 59200 tonnes in 1924. The paper industry had much progressed during the plan periods, which can be seen from the following table.

TABLE ONE

PRODUCTION OF PAPER AND PAPER BOARDS

Year	1951	1956	1961	1966	1967
Production in Thousands Tonnes	134	197	364	585	609

Source: ((36)) Page 538

The paper industry has face many crucial problems like the shortage of raw materials, machines and economic resources. The consumption of paper per person yearly in India is 2 Lbs, whereas in United States of America it is 405 lbs, in England 198 lbs., in Italy, 77 Lbs. and in Japan 70 Lbs. This low consumption of paper in India is only due to the lack of education in India.

The profits in the Paper Industry have decreased continuously over the plan periods which can be seen from the following table.

TABLE TWO

THE PERCENTAGE OF PROFIT IN PAPER INDUSTRY

First Plan	10.7
Second Plan	9.2
Third Plan	7.5

This trend of decrease in profit in Ppper industry is due to the increasing cost (Wages, cost of raw materials etc.) of production, taxes levied on the production of paper etc., It is estimated that 20 to 25 percent of the total yearly production has to be paid as tax. Prices have not been raised, in which has directly affected the profits.

Secondly, the paper industry, due to the shortage of foreign exchange did not enquire new and developed machines, the parts of which can only be imported from abroad. This adversely affected the industry. The Government should be lenient in its exchange - policy towards the paper industry.

Thirdly news print paper mills still lesser in number and 55 percent of the total imported paper was news print in 1967. The country is able only to produce 30 thousands tonnes against the total consumption of 1.3 lakh tons yearly. Only one mill in Nepanagar in M.P. is producing newsprint.

Fourthly, shortage of raw materials is the main problem for the industry. Bamboo, Sabai Grass, Bagasse(inner portion of Sugar Cane) are better for paper, but are not in adequate.

Fifthly, indiginous production of machinery should be encouraged. Researches in this field is also desirable. India should promote further research in order to minimise the cost of production and to impeove the quality of paper. Indian pulp and paper, technical Association should come forward in this field. The Forest Research Institute Dehradun, Regional Research Laboratory at Jorhat, Assam, are busy in carrying out researches in the fields related to paper industry. The School of Paper Technology established at Saharanpur for training Junior technicians for the paper industry is another land mark

in the country. However, the faciliti s available at the three institutions are still not sufficient to take the Indian Pap r Industry to the level of their counterparts in other advanced countries of the world.

There is dearth of qualified and experienced personnel in the country to man the senior positions in the industry. There is need for creating an institute of advanced studies in paper technology in order to take care of the future requirements of the industry. Such an institute might also cater to the requirements of the neighbouring countries, also

8:2 EMPLOYMEN STRUCTURE:

According to the Annual Survey of Industries, 1963, the Paper Industry as a whole, employed 40,023 persons, out of which, 32,596 are workers. Further, 28,595 were directly employed (28,028 men and 567 women) and 4001, were employed through contractors and as such 7427 persons were employed, as other than workers (See Table Three) It is interesting to learn from this survey((61)) that unpaid family workers were not included in the foregoing figures.

In 1958, an occupational wage survey was conducted by the Labour Ministry ((73)). This industry employed an estimated tota number of about 2,94,00 workers at the time of the survey. The entire working force in the industry was categoriged into 114 occupations, of which 46, selected for detailed study,

TABLE THREE

EMPLOYMENT STRUCTURE AND PROGRES IN FACTORY NUMBERS

No.of Factories Registered.	Factories giving returns	Total Employment			Employment Per Factory			
		Workers	Other Than Workers	Total.	Total	Men	Women	Children
2	3	4	5	6	7	8	9	10
41	38	19976	2255	22231	544	451	30	0.26
43	3	19151	24483	21594	503	436	24	0.08
43	36	17442	2414	19856	462	422	23	0.06
50	45	19358	2634	21992	440	380	17	-
49	47	21822	3517	25339	517	396	22	-
54	49	23445	3542	26987	499	412	22	-
55	49	25539	4380	29919	545	436	22	-
58	51	28257	5155	33412	576	456	22	-
58	54	30355	5506	35861	527	472	22	-
27	26	27558	5046	32604	1208	N.A.	N.A.	-
27	26	6012	946	6958	258	200	12	-
11	11	1573	126	1749	159	128	4	-
23	22	2249	267	2516	109	89	3	-
42	39	32596	7427	40023	453	72	14	-
23	23	2105	165	2628	114	82	2	-

Source: Table 8:3

N.B.: Figures are rounded.

* After 1958, i.e. in 1959 only paper (Writing, News prints, wraping) and in 1960 paper and paper boards and straw boards and in 1961 and onwards paper and paper products data are collected. In 1963 figures are for paper and paper boards.

accounted for more than 90 percent of the total estimated employment. Of the selected occupations 23 accounted for 75 percent of total employment in the industry.

Women workers constituted nearly 7 percent of the total working force and child-workers were negligible. Women workers were found employed as supervisors(o.4 percent), Assistant Supervisors(1.3 percent), Bale makers(4.8 percent), Finisher Paper(29 percent), Attendant Electrical Motor(8.2 percent), Finisher Card Board(18.3 percent), Sweeper(12.3 percent), Ream Carrier(27.5 percent), Rag Sorter(55.6 percent), labelling Helper (26.7 percent), Unskilled Helper(5.5 percent) and 3 percent children), Sorter(99.1 percent) and Box Bounder (1.8 percent) in the industry.

The employment potential of the paper industry does not seem to be high, irrespective of the size of the plant. In a small scale plant of 5 tonnes per day capacity costing about 36.27 lakhs, the employment potential may not be more than 100 persons. Besides these permanent workers, there is a good number of contract workers employed on certain jobs which are essentially of intermittent nature in view of the peruliar nature of operations in the paper industry. For this purpose, the contract system should be retained in the industry. In addition to those who are employed in the paper mills, about a hundred thousand persons are estimated to be employed in forest operations for extracting bamboos, grass etc., to provide raw material for the paper industry. Forest labour are seasonal and piece-rated. In some states, minimum wages are fixed under the Minimum Wage Act.

8:3 WAGE STRUCTURE:

Paper industry do not have fixed and standard wage rates for workers. Fixation of wages in the Paper Mill Industry is initially made by the employers. In a number of mills, wages have been fixed as a result of tribunal awards appointed by the State Governments on the basis of industrial disputes raised over there. But in most of the mills, wages have been fixed and occassionally these have been revised and improved considerably as a result of collective bargaining with the unions operating in the mills.

In the course of equiry it transpired that in Titaghar Paper Mills, Titaghar, grades and scales of the wages of the different categories have been made after a scientific study conducted by a committ e consisting of representations from employers and employees under the guidance of National Productivity Council, New Delhi. In the case of Bengal Paper Mills, Raniganj, this has been done by the Industrial Consultants Messrs Ibcons Ltd., Calcutta. (( )).

Wages and allowances of the workers in the industry have improved considerably since 1944-'41, when the Rege Committee ((9)). conducted that the wage level then obtaining in the paper industry, was none of them too high and was slightly lower than that in other organised industries in the country. An occupational Wage Survey conducted by the Labour Bureau in 1958-'59 revealed that in paper industry, wage rates differed considerably. The wages varied from Rs. 1.35 per day in respect of lowest paid workers to Rs. 10.24 per day for the highest paid workers.

In 1958-'59 the average wage of Rs. 3.50 compriced of the following components.

i)	Basic earnings at the rate of	..	Rs. 2.96
ii)	Production/incentive Bonus	..	Rs. 0.15
iii)	Attendance Bonus	..	Rs. 0.05
iv)	Shift Allowances	..	Rs. 0.01
v)	Overtime payment	..	Rs. 0.19
vi)	Others	..	Rs. 0.14
	Total (Inclusive of DA)	..	Rs. 3.50

For a clear and scientific analysis of the wage differentials, 10 occupations out of 46 major occupation(taken for the study by O.W.S. out of 114 occupation) have been selected for the present study. ((68)).

The selection of occupations of the total number of employment in the occupation(See Table Four). In this industry skilled helpers and unskilled helpers (estimated employment at the line of survey was 1665 and 11098) were getting average daily minimum and maximum wages of Rs. 2.71 and Rs.3.71 and Rs. 2.33 and Rs. 2.55, respectively, whereas Foreman and Junior Foreman received Rs. 6.02 and Rs. 10.24 and Rs. 4.17 and Rs. 7.05 respectively. The basic earnings at these four occupations are Rs. 2.41, Rs. 2.95, Rs. 6.62, Rs. 4.69. Except the cost last two the other two obtained incentive bonus, attendance bonus, shift allowance, over time and others(See Table 4).

The average daily minimum and maximum wages, taking all the occupations together, worked out to Rs. 2.67 and Rs. 3.55 respectively at the time of the survey. The lowest average minimum wage rate was Rs. 1.35 per day in respect of Sorter and the highest was Rs. 6.00 per day in the case of Foreman. The maximum average wage rate ranges from Rs. 1.80 to Rs. 10.24 per day in the case of these occupation. The ...

i)	Basic earnings at the rate of	..	Rs. 2.96
ii)	Production/incentive Bonus	..	Rs. 0.15
iii)	Attendance Bonus	..	Rs. 0.05
iv)	Shift Allowances	..	Rs. 0.01
v)	Overtime payment	..	Rs. 0.19
vi)	Others	..	Rs. 0.14
	Total (Inclusive of DA)	..	Rs. 3.50

For a clear and scientific analysis of the wage differentials, 10 occupations out of 46 major occupation(taken for the study by O.W.S. out of 114 occupation) have been selected for the present study. ((68)).

The selection of occupations of the total number of employment in the occupation(See Table Four). In this industry skilled helpers and unskilled helpers (estimated employment at the line of survey was 1665 and 11098) were getting average daily minimum and maximum wages of Rs. 2.71 and Rs.3.71 and Rs. 2.33 and Rs. 2.55, respectively, whereas Foreman and Junior Foreman received Rs. 6.02 and Rs. 10.24 and Rs. 4.17 and Rs. 7.05 respectively. The basic earnings at these four occupations are Rs. 2.41, Rs. 2.95, Rs. 6.62, Rs. 4.69. Except the cost last two the other two obtained incentive bonus, attendance bonus, shift allowance, over time and others(See Table 4).

The average daily minimum and maximum wages, taking all the occupations together, worked out to Rs. 2.67 and Rs. 3.55 respectively at the time of the survey. The lowest average minimum wage rate was Rs. 1.35 per day in respect of Sorter and the highest was Rs. 6.00 per day in the case of Foreman. The maximum average wage rate ranges from Rs. 1.80 to Rs. 10.24 per day in the case of these occupation. The ...

TABLE FOUR

WAGE STRUCTURE AND PER CAPITA DAILY EARNINGS

tions	Estimated No. of workers	AVERAGE DAILY PER CAPITA EARNINGS (In Rs.)					AVERAGE DAILY	
		Basic Earnings	Production Bonus	Attendance Bonus	Over Time Payment	Total Daily Earnings.	Minimum wage (Rs.)	Maximum wage (Rs.)
	2	3	4	5	6	7	8	9
led s	11098	2.41	0.09	0.05	0.12	2.54	2.33	2.55
dhelper	1665	2.95	0.01	0.04	0.21	3.39	2.71	3.70
l	1255	2.72	0.16	0.06	0.58	3.70	2.69	3.21
er Paper	1563	3.97	0.41	0. 6	-	4.60	2.77	4.04
Gr.I	460	4.91	0.42	0.03	0.67	6.45	4.15	6.38
Gr.II	578	3.97	0.30	0.07	0.44	5.05	3.57	4.98
Feeder	552	2.65	0.29	0.04	0.05	3.22	2.61	2.95
	451	1.56	-	-	-	1.55	1.35	1.80
	209	6.62	-	-	0.28	7.11	6.02	10.24
eman	194	4.69	0.01	0.08	0.54	5.40	4.17	7.05

<u>Source</u>: Table 8:1

NB: Only Unskilled helper and Skilled helpers were getting shift allowance at the rate of Rs. 0.01 daily.

Others sorts of allowances rage between Rs.0.04 to 0.42 except in the case of sorter.

All the occupations were exclusively of male-employment, except the occupation sorter where percentage of women worker was only 1.8

Except the occupations Finisher Paper and Sorter, all the selected occupations were time rated. The percentage of piece rated workers in the case of Finisher Paper was 64.7 and in the case of it was 2.8

wage rates of the majority workers (77 percent) in the industry ranged from Rs. 2.01 to Rs. 3.00 per day. The average daily wage rates of the women workers were less than those of men in most of the common occupations for them in the industry.

DEARNESS ALLOWANCE:

As many as 89 pe cent of the workers were getting separate dearness allowance apart from the basic wages. In 37 percent of the sampled units D.A. was paid to the workers. About 46 percent of workers were receiving dearness allowance at a flat rate and another 41 percent according to Income slabs. Only in the case of 7 percent workers the D.A. was linked to the consumper's Price Index Numbers.

BONUSES:

The average earnings of the workers stood at Rs. 3.50 per day taking all the occupations 99 ((68)) together in the industry. Basic earnings (Basic wage Plus Dearness Allance) formed the most important part of the total earnings of the workers. Production Bonus/incemtive Bonus, Attendance Bonus, Shift Allowance, Overtime and other earning constituted an insignificant proportion of total earnings of the workers. The Incentive Bonus was maximum Rs. 0.42 per day and minimum Rs. 0.01 per day in the case of Fitters Grade I and Junior Foreman, respectively. So far as the Attendance Bonus is concerned it was maximum Rs. 0.16 per day and minimum Rs. 0.01 per day in the case of Evaporator men and unskilled helpers(and lakunderman) respectively. As much as Rs. 0.81 per day and Rs. 0.01 per day is the maximum and minimum shift allowance in the case of Picker Boy/and unskilled helpers and several others respectively. Overtime payment was received by 90 percent of the workers. Maximum and minimum overtime per day

was Rs. 0.67 and Rs. 0.01 in the case of Fitter grade I and cutter man.

Women earnings were generally less than those of men. Similarly the earnings of piece rated were generally higher than the earnings of time rated workers.

Amout 35 percent of the workers were earnings from Rs.2.01 to Rs. 3.00 per day; 27 percent workers from Rs. 3.01 to Rs.4.00 per day and Rs. 13 percent workers from Rs. 4.01 to Rs. 5.00 per day in the industry. Till 1958-59 no amendment was made in the minimum wage Act 1948.

8:3.1 REGIONAL WAGE DIFFERENTIALS:

It now transpires that average daily earning of the worker in the paper mills have considerably improved. In Bengal Paper Mill Co.Ltd., Raniganj, the average daily basic earnings of an unskilled labour is Rs. 3.39 per day with a monthly Dearness Allowance @ Rs. 50/- for the first Rs. 100/- and thereafter 15 pe..ce on subsequent Rs. 100/-. In Titaghar Paper Mills, monthly Wages of an unskilled labour amount to Rs. 35/- with a Dearness Allowance at a flat rate of Rs. 92.20.

From Table Five, it is clear that in Andhra Pradesh lowest wage (Rs. 9/- per month) was paid to unskilled labour. It ranged between Rs. 8/- to Rs. 13/- per month. In U.P.minimum basic wage per month was Rs. 11/- to Rs. 26/- per month. In West Bengal minimum basic wage was Rs. 30/- to Rs. 52/- per month, which was highest in the country. Thus there was a significant difference of Rs. 22/- between two persons one getting Rs. 30/- and other Rs. 52/- per month. In the case of Travancore Cochine minimum differences of Rs. 2/- is seen between two workers.

TABLE FIVE

REGIONAL DIFFERENCES IN MINIMUM BASIC WAGES, DEARNESS ALLOWANCE AND TOTAL EARNINGS IN PAPER & PAPER BOARDS INDUSTRIES

per Mills (Unskilled Labour, 1955)	Minimum Basic Wage (Rs. P.M.)	Dearness Allowance (Rs. P.M.)	Total Earnings (Rs.P.M.) (Skilled Labour)	Average Earnings wage (Rs.P.M.)
	2	3	4	5
st Bengal	30-52	8 - 35	38 - 87	77 - 171
har	21	35	56	60 - 115
mbay	20-33	Nil-35 to 90% of basic wage	-	2[illegible] - 120
dhra Pradesh	8-13	0 - 18	-8 - 31	33 - 69
derabad	17-30	22	-	53 - 85
dhya Pradesh	31	17	48	44 - 197
sore	23	20	43	43 - 101
.ssa	20-24	10 - 12	30 - 36	70 - 133
jab	Consolidated	-	54	N.A.
ar Pradesh	11-26	24- 32	35 - 58	46 - 110
vancore hin	26-28	26	52 - 54	62 - 74

Source: Indian Labour Gazette 1955.

'NB'* N.A. = Not available

'P P.M. = Per month

Total earnings of skilled labour was highest Rs. 35.58 in Utter Pradesh but Travancore Cochine maintained minimum difference at Rs. 2/- between the workers. In Utter Pradesh the dearness allowance was Rs. 24-32, which was more than the minimum basic wage. In Bihar, West Bengal and Travancore Cochine dearness allowance was Rs. 8.38, Rs. 35/- and Rs. 26/- respectively. In Andhra Pradesh dearness allowance was Rs. 0.18, which was lowest in India.

Average Wage was highest Rs. 44-197 in M.P. Lowest wage of Rs. 33-69 and Rs. 25-120 was paid in Andhra and Bombay.

Regional or interest state differentials may exist due to many reasons. Some of them are abundant supply of labour, lack of employment potentials, seasonal unemployment, lack of alternative employment and occupations and geographical differences.

Common benefits in the industry are ; Provident Fund, Medical Facilities (covering their dependants where E.S.I is not available). Housing facilities varying from 10 percent to 95 percent of the workers in the bigger units.

SYSTEM OF PAYMENT: ((68)), ((73))

As many as 92 percent of the occupations in the industry were time rated. As such an overwhelming majority of workers (96 percent) were paid wages according to time rated (scales). About 29 percent of the workers in the industry were paid wages at the end of the month and about 20 percent at the end of a fortnight. Very few workers got their wages at weekly intervals. In the case of Lakudar man, Fainisher Paper, Screen operator, Ream Carrier, machine-man and Box Bundler, workers were both paid time-rated and piece rated wages which can be seen from the Table Six given below (and also from Table 8:1)

TABLE SIX

PERCENTAGE OF SYSTEM OF PAYMENT

	Occupations	Percentage of Time-Rated	Piece-Rated
	1	2	3
1.	Lakudar Man	83.1	16.9
2.	Finisher Paper	35.3	64.7
3.	Screen Operator	97.1	2.9
4.	Ream Carrier	98.8	1.2
5.	Machine man	97.2	2.8
6.	Box Bundler	95.6	4.4

Source: Extracted from Occupational Wage Survey 1958 -59, Table 8:1

Roughly,85 percent of the workers employed in the industry were permanent and 13 percent temporary, rest 2 percent seasonal, but there is greater certainty of their being employed in every season. The proportions of workers classified as Badli(Casual) and apprentices were negligible.

8:3.2 As much as Rs.1709.00 was maximum yearly wage in 1963 received by workers whereas this figure is Rs. 15200.00 in 1964 in the case of non-workers(i.e. persons other than workers), which shows that ministerial staff enjoy much of the portion of the total wage bill. Real wage (inclusive of house facility, bonuses medical facilities etc.,) is gradually increasing from 1989 per head in 1950 to 199 in 1964. It has just increased a times. Total wages and benefits have received lesser percentage of value added in 1964, 37 percent than 50 percent in 1960. (Vide Table 8.2 and 8.3).

The wages, bonuses, dearness allowance and other allowances received by persons, which have been surveyed and censued by A.S.I. and C.M.I. were fixed and ...

TABLE SEVEN

CADRE DIFFERENTIALS

rs	Wage per Worker In Rs.	Wage per otherthan workers In Rs.	Real wage per persons In Rs.	Wage benefits as percentage of value added
	2.	3	4	5
)	904	2408	49	50
.	1050	2899	59	41
2	1104	3198	43	41
3	1011	3112	55	49
.	973	2795	53	50
)	1023	3095	79	35
	1078	3009	95	39
	1122	2933	82	39
	1195	2992	88	34
	1359	3623	82	38
	1212	3221	111	48
	1193	4831	101	31
	1161	4291	112	60
	1709	4078	193	49
	1393	15200	199	37

Source: Table 8:2 and 8:3

NB: 1) Figures are rounded off.

2) Person includes both workers and non-workers.

industry according to the Minimum Wage Act 1948, for unskilled workers. Mysore state revised its scale for this class of workers in 1966 from Rs. 70/- p.m. to Rs. 105/- per month. Till now the same scale of pay has been implemented in this industry. Unlike other industries no Central Board has been appointed to study the conditions of the industry. (See Table 7).

Uptil now a descriptive picture, problem, characteristics of the paper and paper-boards industry has been studied. Now in the coming section of the study some statistical-tools like Correlation analysis, Timeseries Analysis, Trend Line Analysis, Analysis of Variance etc.,and Statistical Tests like Chi-squared tests, t - tests etc., have been most frequently used.

8:4 AVERAGE YEARLY EARNINGS : (1950-'64)

It has been attempted to calculate average yearly earnings trends in regards to the employees of Paper and Paper Boards Industry during 1950-'64.

It is preferred to fit a parabolic a regression of the order of second degree, only because of the fact that the second differnnce of the dependent variable (Y), defined as,

$$\Delta^2 Y_i = \Delta Y_i - \Delta Y_{i-1}$$

is almost nearly constant and satisfied the conditions for line of best fit. This is shown in the following table

TABLE EIGHT

Reference Table No.	Regression used	Regression Equation	Annual Rate	Residue
1.	2	3	4	
8.6	Parabolic	$Y = 4.33 + 0.25\,t + 0.031\,t^2$	4.91	1.98
	(Vide Figure 8:1)			

SOURCE : Table 8:6

where, Y stands for average yearly earnings in terms of money of the persons employed in the Paper Industry, t for time measured in years with reference to 1957 as origin. Hence, we conclude that our parabolic regression shown by the equation.

$$Y = 4.33 + 0.25\,t + 0.031\,t^2$$

represents the best fit line with a positive acceleration and trend amounting 0.031 and 0.25 per annum respectively.

GOODNESS OF FIT TEST:

It is worthwhile to apply the Chi-squared test(χ^2-test), which is test of the agreement (or consistency, or confirmity) between a theoretical (Hypothetical) and Sample distribution. Karl Pearson's approximation which is shown as,

$$\chi^2 = \sum\left[\frac{(n_i - np_i)^2}{np_i}\right]$$

may be schematically as,

$$\chi^2 = \sum\left[\frac{(O_y - E_y)^2}{E_y}\right]$$

where, O_y is the observed and E_y, expected frequency. As it is clear, this χ^2 may be considered as a measure of discrepancy between O_y and E_y. If, there is no discrepancy,

then $\chi^2 = 0$. Suppose our sample distribution agrees with the hypothetical (theoretical) distribution. In other words, our null hypothesis is,

$$H_1 : O_y = E_y$$

The value of χ^2 of the χ^2 test is given by $\chi^2 = 0.358$ (Vide table 8.6). The 5 percent critical value of $\chi^2 = 22.4$ corresponding to 13 degrees of freedom, is greater than the computed value of $\chi^2 = 0.358$. The computed value of χ^2 does not lie in between the "rejection region", that is $\chi^2 \geqslant 22.4$

CONCLUSION:

a) Hence, for 5 percent level of significance, our $\chi^2 = 0.358$ is not significant.

b) So, our fit is good and theme is a great agreement between observed and theoretical value of earnings of the employees of the Paper and Paper-Boards Industry.

c) In other, words, our parabolic line,

$$Y = 4.33 + 0.25\ t + 0.031\ t^2$$

is best fit line to the data of the table 8:6. From Figure 8:1, it is clear that fit is good and error is more or less nill.

8:5.1 RELATIONSHIP BETWEEN YEARLY WAGE BILLS AND YEARLY VALUE ADDED:

A liner regression of X (total wage bills) and Y (Value added) is calculated by the help of the least squared method in (Table 8:7) which can be seen from the table given below:

TABLE NINE

Reference Table No.	Regression used	Regression Equation	Annual Rate	Residue
1	2	3	4	5
8:7	Linear	$X = 0.66 + 0.31o\ Y$ (Vide Fig., 8:2)	3·43	14·47

Source: Table 8:7

The linear regression represents the best fit and corresponding equation is

$$X = 0.66 + 0.319\ Y$$

which explains X in terms of Y. The Co-efficient of regression is given by $b_{xy} = 0.319$. It indicates that during 1950-1959 the value added shows an increasing trend rate.

The significance of b_{xy} is tested by t - test. The relevant value of t is given by

$$t = (b_{xy} - \beta_{xy}) \sqrt{(n\ 2)\ \Sigma(Y-\bar{Y})^2 / \Sigma(X-\bar{X})^2}$$

Assuming, $\beta_{xy} = 0$ and substituting the various values from table 8:7,

$$t = 0.319 \sqrt{8 \times 146,73 / 14.73}$$

$$= 0.319 \times$$

$$=$$ (Approximately)

which is greater than 5 percent critical value of $t = 1.86$, corresponding to 8 degrees of freedom. Hence, we reject the null hypothesis and our empirical regression co-efficient $b_{xy} = 0.319$ is significant. Therefore, there is sufficient reason to believe that population exhibits a linear relationship

b

between salaries and wages and value added. So increase in wages is not merely by chance.

8:5.2 RELATIONSHIP BETWEEN YEARLY WAGE BILLS AND YEARLY VALUE ADDED

It is interesting to study the total yearly wage payments in relation to the production in money terms (value added).

A linear regression of Y(Value added in thousands Rs.) on X (Total wage bills) is calculated by the help of the least squared method in table 8:7, which can be seen from the table given below:

TABLE TEN

Reference Table No.	Regression used	Regression Equation	Annual Rate	Residue
1	2.	3	4	5
8:7	Linear	$Y = 4.33\ X - 6.57$	9.95	146.73

(Vide Fig., 8.2)

Source Table 8.7

The linear regression equation represents the best fit and the corresponding equation is

$$Y = 4.33\ X - 6.57$$

which explains Y in terms of X, Y being the value added and coefficient of regression is by $b_{yx} = 4.33$
It indicates that during 1950-1959, the value added shows an increasing trend rate.

The significance of ~~b_{xy} is~~ b_{yx} is tested by the t-test. The relevant value of t is given by

$$t = (b_{yx} - \beta_{yx}) \sqrt{(n-2)\ \Sigma(X-\bar{X})^2 / \Sigma(Y-\bar{Y})^2}$$

Assuming $\beta_{yx} = 0$, and substituting the various values from Table 8:7

$$t = 4.33 \sqrt{8 \times 14.73 / 146.73}$$

$$= 4.33 \times 0.89$$

$$= 3.8537$$

which is greater than 5% critical value of $t = 1.86$, corresponding to 8 degrees of freedom. Hence, we reject the null hypothesis and our empirical regression coefficient $b_{yx} = 4.33$ is significant. Therefore, there is sufficient reason to believe that population exhibits a linear relationship between salaries and wages and value added. So increase in value added is not merely by chance.

8:6 CORRELATIONS BETWEEN WAGES OF WORKERS AND VALUE ADDED (1950-1959)

An attempt has been made to calculate the Karl Pearson's correlation coefficient between total value added (in Millian Rs.) for a period of 15 years from 1950 to 1964 by the following formula

$$r = \frac{\Sigma xy - (\Sigma x)\ (\Sigma y/n)}{n\sqrt{\left(\frac{\Sigma x^2}{n} - \left(\frac{\Sigma x}{n}\right)^2\right)\left(\frac{\Sigma y^2}{n} - \left(\frac{\Sigma y}{n}\right)^2\right)}}$$

on putting the various values from table 8:5, the value of r is given by

$$r = \frac{25.[illegible] - 10\ (-5.1/10)\ (-7/10)}{10\sqrt{(6.91/10 - (-5.1/10)^2)\ (151.57/10 - (-.7/10)^2)}}$$

$$= 0.97 \text{ (Approximately)}$$

It is worth while to test the significance of this correlation coefficient to strengthen our result. This can be tested by the use of t - distribution, or by the use of null hypothesis. Here, we will use both t distribution test and sampling distribution test for r.

SIGNIFICANCE OF CORRELATION COEFFICIENT 'r'

i) By using t - distribution:

The value of t under the hypothesis that correlation coefficient ρ in the population is zero, is given by

$$t = r / \sqrt{(1 - r^2) / (n-2)}$$

which has t - distribution with ϕ = (n-2) degrees of freedom.

Putting the various values from table 8:5, the value of t of t-tests is given by

$$t = 0.97 / \sqrt{(1 - (0.97)^2) / (10-2)}$$

$$= 0.97 / \sqrt{0.0591 / 8}$$

$$= 0.97/0.08 = 12.12 \text{ (Approximately)}$$

which is greater than 5 percent critical value of t = 1.860 for (10-2) or 8 degrees of freedom. The computed value of t, therefore, does not lie in the acceptance area" of the 't' distribution and we are inclined to reject the null hypothesis i.e. $\rho = 0$. Hence, the correlation coefficient r = 0.97 is significant at 5 percent level.

Therefore, there is a strong correlation between total value added and wages paid to the workers. It has not arisen due to chance.

ii) USE OF CORRELATION COEFFICIENT TABLE

When $\rho = 0$, we find an exact sampling distribution of 'r' that is, symmetric about zero with a variance r of,

$$\text{Variance } (r) = 1 - r^2 / \sqrt{(n-2)}$$

A characteristic of the sampling distribution of 'r' is that it depends only on ρ and n. Since we have assumed $\rho = 0$, it means the sampling distribution for this case depends on 'n'. Hence, the probable value of 'r' will depend upon the 'n'. The probable value of 'r' for $\phi = (n - 2) = 8$ degrees of freedom at 5 percent level of significance is 0.6319, which is less than the calculated value of 'r'. The computed value of 'r' therefore, does not lie in the "acceptance area", that is

$$P(-0.6319 > r > 0.6319) = 0.95,$$

of r - distribution and we are inclined to reject the hypothesis that $\rho = 0$. Hence, correlation coefficient r =0.88 is significant at 5 percent level.

CONCLUSION:

Therefore, like t - test, unsignificance of r is strongly supported by r - distribution test and it is not merely due to chance.

8:7 TOTAL EARING, (YEARLY), CONSUMER PRICE INDEX NUMBER AND PRODUCTIVITY:

A multiple linear regression of Y (indices of total yearly earnings base 1951), on XI (C.R.I base 1951) and X_2 (productivity indices base (1951) is calculated by the help of least squared method in table 8:8.

~~It come out be be~~

It comes out to be

$$Y = 1.51\,X_1 + 0.201\,X_2 - 0.622$$

According to regression equation, the average yearly earnings (Y), increased on an average of 1.51 for each unit of the consumers price index number (X_1). Similarly, the regression coefficient of X_2, which is 0.201 will increase the total earnings by 0.201 times for every one per cent increase in productivity. During the period of study, the productivity of the employees has been less effective in influencing the total yearly average earnings of the employees of Paper and Paper-Boards industry as compared to the Consumer Price Index Number. The partial regression co-efficients $b_{y1.2}$ and $b_{y2.1}$ are respectively given by 1.51 and 0.201. Their significence can be tested by the use of t - test

<u>SIGNIFICANCE OF</u> $b_{y1.2}$

The value of the t of the t - test is given by

$$t = (b_{y1.2} - \beta_{y1.2}) \sqrt{\frac{(n-k-1)\,\Sigma(X_{1i} - \bar{X}_1)^2}{\Sigma(Y - \bar{Y})^2}}$$

where $\beta_{y1.2}$ = is the corresponding partial regression coefficient in the population from which the regression data have been drawn. We shall test the hypothesis that a change in X_1 in the population does not produce any change in the earnings of the employees. Therefore, the value of t of the t - test is given by

$$t = b_{y1.2} \sqrt{(n - k - 1) \frac{\Sigma (X_1 - \overline{X}_1)}{\Sigma (Y - \overline{Y})^2}}$$

Where n = total numbers of observations, K = number of coefficients to be determined (n - k - 1) = the number of degrees of freedom.

Putting the various values from table 8:8, the value of t of t-test is given by

$$t = 1.51 \sqrt{11 \times 0.32 / 1.32}$$

$$= 1.51 \times 1.61$$

$$= 2.43111$$

which is greater than 5 percent critical value of t = 1.796 for 11 degrees of freedom. The computed value of t, therefore, does not lie in the acceptance area of the t - distribution and we are inclined to reject the null hypothesis, i.e. $\beta_{y1.2} = 0$. So our regression coefficient $b_{y1.2}=1.51$ is significant. The change in the average yearly earnings of the employees of the Paper and Paper Boards industry, as a result of unit change in consumer price index, shown by the regression equation is not due to chance.

SIGNIFICANCE OF $b_{y2.1}$

The value of t, under the hypothesis that corresponding partial regression coefficient $\beta_{y2.1}$, in the population, is zero, is given by,

$$t = b_{y2.1} \sqrt{\frac{(n - k - 1) \sum (X_2 - \overline{X}_2)^2}{\sum (Y - \overline{Y})^2}}$$

Where n and K have their usual meanings.

Putting the various values from table 8:8 the value of t is given by

$$t = 0.201 \sqrt{11 \times 1.15 \;/\; 1.32}$$

$$= 0.201 \times 3.1$$

$$= 0.6231 \quad \text{(Approximately)}$$

which is less than the 5 percent critical value of $t = 1.796$, co rresponding to 11 degrees of freedom. The computed value of t, therefore, lies it the "acceptance area" of the t -distribution and we are inclined to accept the null hypothesis that is $\beta_{y2.1} = 0$. So, our regression coefficient is insignificant. The change in the average yearly earnings of the employees of the Paper and Paper Boards industry, as a result of unit change in productivity indices, is merely due to chance.

COEFFICIENT OF MULTIPLE CORRELATION $R_{y.12}$

The coefficient of multiple correlation betw en the average yearly earnings of the employees of Paper and Paper Boards Industry (Y) on the one hand, and consumers price index number(X_1) and productivity indices (X_2) on the other, is found to study the combined importance of the latter to the former.

It is given by

$$R^2_{Y.12} = \frac{\sum (Y' - \overline{Y})^2}{\sum (Y - \overline{Y})^2}$$

where Y' is the calculated value of the corresponding X_1 and X_2.

Putting the various values from table 8:8, the value of $R^2_{y.12}$ given by

$$R^2_{y.12} = 1.11 / 1.32$$
$$= 0.8409$$

The square of multiple correlation coefficient (also known as coefficient of determination ((33,38))) indicates that about 84.09 percent of the variation in the average yearly earnings of the employees of Paper and Paper Boards industry Y) is determined by the Consumers Price Index Number(X_1) and productivity (X_2). The remaining 16 percent of the variation in Y remains unexplained and is determined by certain other factors like technology, size of establishments, degree of unionization etc., which has not been considered here.

SIGNIFICANCE OF $R^2_{y.12}$

In order to verify, if this conclusion is also true about the population, from which the regression data are drawn, the significance of of $R^2_{y.12}$ is tested by the help of F-test. The relevant value of F-test is given by

$$F = \frac{\text{Variance explained by the Regression Equation}}{\text{Residue variance}}$$

for k and (n - k-1) degrees of freedom, where k is the number of variables eliminated.

The hypothesis being tested is that $\rho_{y.12} = 0$ where $\rho_{y.12}$ is the coefficient of multiple correlation in the population. The following table gives the familiar break up summary of variance.

TABLE ELEVEN

ANALYSIS OF VARIANCE SUMMARY FOR THE OBSERVED REGRESSION DATA

Source of Variation	Sum of Square	Degrees of Freedom	Mean Square
1	2	3	4
Total	$\Sigma(Y-\bar{Y})^2$ $=1.32$	$(n-1)=13$	$\Sigma(Y'-\bar{Y})^2/k$ $= 1.11/2$ $= 0.555$
Linear Regression	$\Sigma(Y'-\bar{Y})^2$ $=1.11$	$K=2$	
Residue from Regression	$\Sigma(Y-Y')^2$	$(n-k-1)=$	$\Sigma(Y-Y')^2/n-k-1$ $=0.42/11$ $=0.038$

Source Table 8:8

Therefore, the value of F of the F-Test is given by

$$F = 0.555/0.038$$
$$= 14.6 \text{ (Approximately)}$$

which is greater than the 5 percent critical value of F-3.98, corresponding to 2 and 11 degrees of freedom. The F - ratio is significant. The computed value of F = 14.6 lies in the "rejection region" of the F distribution. The hypothesis $\rho_{y.12}0$, is therefore rejected. This means that in the population, the variance in the total average yearly earnings (Y) is accounted for by linear regression on consumers price index number (X_1) and the productivity indices(X_2). The conclusion about $R_{y.12}$ is, therefore, strengthened and is not due to chance.

.:8 SIZE OF ESTABLISHMENT, PRODUCTIVE CAPITAL, WAGES AND PRODUCTIVITY:

The smaller units of production of paper and paper boards industry are of the nature of cottage industry and are less mechanized whereas larger units are heavily mechanized. Due to this reason productive capital requirement per person in the establishments employing less than 20 members is Rs.91050. But it increases with the size of establishment. So productive capital requirement per person and the size of establishment bears a positive correlation. (See Table 8.10)

Similarly, from table 8:9, labour productivity increases with the size of establishment ((18)).

To test the validity of the this statement, an attempt has been made to calculate a linear logrithmic regression of the production (value added, Y) an productivity(X,defined as P/W, when P and W are the productions and number of workers respectively), by the method of least - squared in table 8:9.((18)) The summary of the analysis table is given below:

TABLE TWELVE

Reference Table No.	Regression used	Regression '*' Equation	Rate	Residue
1	2	3	4	5
8:9 8:10	Linear Logrithmic Regression	Y = 1.686X + 0.136	5.6	148.89

(Vide Figure 8:3)

Source Table 8: 9, 8:10 '*' Y = Log P, X = Log p/W

Linear regression shown by equation

$\text{Log } P \doteq 1.686 \text{ Log } P/W + 0.136$

represents the best fit line.

It is worthwhile to apply the t-test to test the significance of b - the least-squared regression coefficient as obtained by the best fit regression equation. Suppose is the hypothetical population regression equation co-efficient. By supposing $\beta = 0$, we may test the hypothesis that, in the population, the regression coefficient is zero. This means that there is no relationship between log P and log P/W (i.e. Y & X), in the population.

The value of t of the t - distribution is given by,

$$t = (b - \beta) \sqrt{(n-2) \quad \sum(X-\bar{X})^2 \; / \; \sum(Y - \bar{Y})^2}$$

The quantity t follows the so called t - distribution with (n - 2) degrees of freedom, n being the number of observations, because two constants have been eliminated for the data.

Therefore, on putting the various value from table 8:9 the value of t is given by

$$t = 1.686 \sqrt{6 \times 56.48 \; / \; 148.89}$$

$$= 1.686 \times 1.5$$

$$= 2.529 \quad \text{(Approximately)}$$

which is greater than 5 percent critical value of t = 1.947 corresponding to 6 degrees of freedom. Hence, we reject the null hypothesis, and our empirical regression coefficient b = 1.686 is significant. It is concluded, therefore, that our conclusion regarding labour productivity and production is supported statistically also.

8:9 PROFIT:

Profit's study of this industry has also been based on the Reserve Bank of India's study. ((77)). It has been studied separately in three series and three sub-heads.

8:9.1 PROFITS BEFORE TAX:

Profits before tax show an increasing tendency in all the three periods of study. In the first series, the profits have approximately doubled from 1950-'51 to 1955-56. The increase in the second and third series is nominal (See Table 8:1.11 Section 5.1A).

8:9.2 PROFIT AFTER TAX:

Profits after tax have increased in the first two series and decreased in the third. It was highest Rs. 196 lakh and lowest Rs. 113 lakhs in the years 1955-'56 and 1950-'51 of the first series. Similarly the highest and lowest profits are Rs. 334 lakhs and Rs. 137 lakhs in the years 1959-60 and 1957-58. Similar figures for third series are found Rs. 350 lakhs and Rs. 307 lakhs in the years 1960-'67 and 1961-'62.

8:9.3 PROFITS AFTER TAX AS A PERCENTAGE OF NET WORTH

This percentage was maximum 13.3, 12.4 and 9.9 in the years 1951-'52, 1959-'60 and 1960-'61 and minimum 8.3, 6.3 and 7.1 in the years 1954.55, 1956.57 and 1962.63. It is more or less stationary in all the three series.

8:10 CONCLUSION:

(a) From the above study it can safely be concluded that -

(a) there is a strong correlation ($r = .97$) between total value addded and wages p id to the worke s It is statistically significant, at 5 percent level(Vide Section 8:6)

(b) aver ge yearly earnings pos ess a parabolic trend with positive acceleration and trend amounting 0.031 and 0.25 per annum respectively. (Vide Section 8.4)

(c) there is a linear relationship between salaries and wages and value added. The regression co-efficient $b_{y\bar{x}} = 4.33$ is significant at 5 percent level. (Vide Section 8.5.2).

(d) there is a linear relationship between value added and salaries and wages. The regression co-efficient $b_{xy} = 0.319$ is significant at 5 percent level (Vide Section 8:5.1).

(e) the partial regression co-efficient $b_{y1.2} = 1.51$ is significant. In other words the change in the average yearly earnings of the employee of the Paper and Paper Boards Industry, as a result of Unit change in Consumers Price Index Number, shown by the regression co-efficient, is not due to chance. (Vide section 8:7)

On the other hand our partial regression co-efficient $b_{y2.1} = 0.201$ is insignificant at 5 percent level, proving there by that the change in the average yearly earnings of the paper industry, as a result of unit change in productivity indices is merely due to chance.

Taken together 84 percent of the variation in the average yearly earnings of Paper and Paper Boards industry (Y) is explained by Consumers Price Index Number(X_1) and productivity indeces(X_2). It has statistically been supported also, as co-efficient of multiple correlation is significant. (See section 8:7)

(f) The labour productivity and production bears a positive correlation in respect of to the size of establishment. Our regression of coefficient b = 2.529 is significant at 5 percent of significance (Vide Section 8:8)

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CHAPTER 9

IRON AND STEEL INDUSTRY

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CHAPTER NINE
IRON AND STEEL INDUSTRY

9:1 INTRODUCTION:

India's steel industry attained a rate of growth over a decade roughly spanning the Second and Third Plan Periods, which was rapid by any standards. In fact if we ~~have~~ leave out Russia and Japan, it is hard to find another example of such a fast steel development any where else in the world.

India's Iron and Steel plants developed in with the collaboration of West Germany, Russia and United Kingdom. The capacity of India's Steel Industry was raised fourfold in a matter of five to six years, from 1.5 million ingot tonnes to 6 million ingot tons((53)). Tata's went up from One Million ingots tonnes to two million ingots tonnes and Indian Iron and steel from 5,00,000 tonnes to million tonnes.

In the next half the largest was to raise the capacity by another 4.2 million ingot tonnes, through expansions of the existing public sector steel plants at Bhilai, Durgapur, Rourkela, and Bokaro. It is obvious that if we don't restrict, our steel plants can produce so much steel which it will be beyond our capacity to consume. But from several directions, there are several factors that restrict the development of the Iron and Steel Industry. Of course the fault does not lie with the industry itself. It is because of the suspension of planning in the country, the consequent postponement of major projects in the public sector, and the slow down in the railway development plan, which have kept down the demand for steel, particularly

for the types of steel the two of the three (Bhilai & Durgapur), public sector steel plants are designed to produce. This suspension of major plans has shaken the faith of other linked steel consuming industries and private industries. Besides price control of Iron has also affected this Industry.

The problem in short-term is not one of continuous growth, although some experts advise this. In the public sector of the industry in India at least, the immediate problems and to raise labour productivity in the plants and to make the management more efficient. Mr. R.P.Sinha in Rourkela and General Wadehra ((53,P.74)) in Durgapur Steel Plant are working in this direction.

The future of the Indian Steel Industry will depend on the speed and thoroughness with which the present managements can bring about higher labour productivity and introduce major technological changes to get over certain basic difficulties, like having to use inferior Coal and Iron ore with a high alumina content. They will, of course, be judged by their export successes, which are already commendable, but an export drive which is sustained by heavy subsidy payments does not speak highly of the efficiency of an industry.

Thus, it is not possible to give a very clear picture of the conditions of this infant but growing industry, but as mentioned already, it has received many shocks at its very birth. The main problems facing Iron and Steel companies may be (i) the problems of capital, lack of technical knowledge, lack of fuel i.e. coal, rationalization of mines of iron, decentraliza-

tion of industry and high prices of Iron and adequate amount of raw materials etc.

9:2 EMPLOYMENT STRUCTURE: (Vide Table 9:2)

If we scrutinize table No.One, it is clear that the total employment in the Iron and Steel Industry has risen nearly 2.5 times in the fifteen year period between 1950 and 1964, from 76.5 thousands to 178.0 thousands. It shows are increasing trend through out the period under study.

This trend has been maintained by the employment per factory also. It has doubled in this period of 15 years (1950 to 1964) from 487 to 843.0 respectively. The rates of Men Workers per factory has also increased. The ratio of Men and Women employment per factory has been more or less constant through out the period. Children employment was negligible.

9:3 WAGE STRUCTURE

From Table One it is clear that the wages of the workers and other than workers has increased through out the period from 1950-to 1964. The ratio of the wages of the workers and other than workers was more or less constant through out the period. Workers and other than workers were being paid approximately in a ratio of 1:2. Total wage bills as percentage of value added was nearly constant and it was at an average of 50 percent.

It will be interesting to go into some details for the study in the wage structure of the employees of Iron and Steel Industry. The development of a rational wage structure in the Iron and Steel industry is a matter of vital importance to the economy. With the growing industrialization of the country

TABLE ONE

TABLE SHOWING EMPLOYMENT AND WAGE STRUCTURE IN IRON & STEEL INDUSTRY (1950 - 1964)

Total Employment (000)	EMPLOYMENT PER FACTORY Total	Men	Women	Children	WAGES Per Worker (in Rs. '000)	Wages/Other than worker (in Rs. '000)	Wages & Benefits as percentage of value added
2.	3.	4	5	6	7	8	9
76.5	487	349	18.8	0.004	1.4	2.6	54.0
79.0	594	353	18.7	0.001	1.7	2.6	5[illegible].7
78.4	572	414	21.3	0.001	1.8	2.9	55.3
77.0	637	483	25.1	-	1.8	2.9	47.5
35.6	680	475	22.4	-	1.7	2.7	42.6
39.2	720	528	24.4	-	1.7	2.8	42.5
38.0	628	446	20.3	-	1.9	3.1	36.9
0.1	614	483	24.8	-	1.8	3.2	41.4
3.2	~~55.9~~ 559	183	17.8	-	1.0	1.6	47.3
[illegible].5	~~10.18~~ 1018	NA	NA	-	2.1	3.8	52.8
39.9	816	596	20.1	-	2.3	3.9	57.9
2.9	710	523	16.7	-	2.3	4.0	52.8
4.0	1122	787	17.0	-	2.0	4.0	58.3
5.1	990	653	40.0	-	2.5	3.3	57.1
78.0	843	593	13.5	-	2.5	4.5	50.8

Source: Table 9:2, 9:3

'*' NA = Not available.

the entire cost structure of the economy will come increasing under the sway of steel prices which will obviously reflect, among other thin s, the industry wage costs. It is, therefore, important to study the evolution and the present structure of wage in this important industry.

There has been seen an inter-plant wage differentials in the early fiftees, when there were only three plants. Tata Iron and Steel Co.Ltd., (TISCO), the Mysore Iron and Steel Ltd. (MISL) and Indian Iron and Steel(IISCO).

Daily wages to the unskilled workers in these three industries can be seen from following Table:

	TISCO	IISCO	MISL
Men	75 Paise	50 Paise	62 Paise to Rs.1.25

In terms of total payments TISCO was paying highest wages.Women were getting lesser than men. After the establishment of Bhilai, Durgapur and Rourkela, the wages for unskilled low paid worker in(1957) are given below:-

Name of the Factory	Basic Wage Rs. P.M.	Dearness Allowance etc. Rs. PM	Total Rs. PM
1.	2	3	4
TISCO	47.06	45.00 2.80	94.86
IISCO	26.00	35.00 9.00	74.00
MISL	26.00	35.0 25 a	86.0
HSL (Three public sector plants)	70.00	15.00	85.00

Source: Report of the Expert Committee on Wage differentials, Central Wage Boards for Iron and Steel Industry, 1965 Chapter VI(P.98)

It is clear from above that IISCO was lowest wage plant.

The scale of wages recommended by the Wage Board for the lowest paid unskilled worker inside the plants is as given

	Basic Pay Men	Women	DA	TOTAL Men	Women
TISCO IISCO	61-2-71	51-2-71	64	125-135	115-135
HSL	80-2-90	70-1-71 2-85	45	125-135	115-130
MISL	65-2-75	55-2-75	50	115-125	115-125

Source: Ibid Chapter XII P. 210 ((83))

One curious effect of the implementation of this recommendations would be that the wage differential between men's wages and that of women ~~and~~ will worsen slightly in the initial stage of the new wage scale for TISCO. Thus, whereas in 1949, the wage of an unskill women worker was 96% of men's wage, after the implementation of the recommendations it would be around 92% only. However the maximum of the both sexes is same for both the TISCO & IISCO. After the implimentation of the wage boards, recommendation the wages in all the three public sector will be the same D.A. has been paid linked with C.P.T.

Now in the next paragraphs the study will based on the work done by the Expert Committee on Wage differentials. In the job evalution this committee considered the following points.

i) education, ii) experience, iii) initiative,
iv) manual skill, v) physical effort vi) mental and /or visual efforts, vii) responsibility for tools and equipments viii) responsibility for materials,
ix)responsibility for pace of production. x) responsibility

xi) responsibility of safety of others, xii) Hazards, and xiii) surroundings.

With this as background this committee determined the Job content and nomenclature of the job; on this basis it can be safety concluded.((10, P.29))

(a) The earnings of low wage workers in TISCO are higher than in the public sector plants but it is lower in the three higher wage workers

(b) Earnings in the three public sector plants are more or less uniform.

(c) Lowest earnings are in the case of IISCO in all the occupations.

(d) The difference between highest and lowest paid worker was lowest for TISCO -- the index being 171.97 and 100 for the two jobs, and highest for Rourkela -- the index being 269.73 and 100 for the similar two jobs. It is in the case of Bhilai and Durgapur

This pattern of uniformity is a slightly disturbed as we turn to the jobs in the Primary Mills Group.

(a) There is a wage differentials with in the plant and out-side the plant for the same cadre of employee (in public sector too) are most frequent.

(b) TISCO's primacy as the best paying concern is again impressive. In seven of the jobs their payment is highest.

(c) IISCO continues to trail behind the other plants in respect of the magnitude of its employee's earnings.

From the above it is concluded that general wage pattern seems to place public sector plants as the top payers, followed by TISCO with IISCO trailing way behind.

In the case of skilled labour of the different groups of work, the differentials are most often. In the Blast Furnace Group the differential in TISCO is the least (1.1.72). Then in ascending order comes IISCO(1:1.78). The public sector plants have higher differentials, the highest being in the case of Rourkela(1:2.70). In the case of Bhilai and Durgapur differentials are the same (1:2.07). It is also in the case of maintenance group.

Thus when we consider the earnings to the exclusion of incentive bonus, the ranking is as follows: TISCO has the first rank followed by Rourekela, Durgapur and Bhilai and IISCO in that order with incentive bonus included the ranks are IISCO, TISCO, BHILAI, DURGAPUR AND ROURKELA.

9:4 AVERAGE YEARLY EARNINGS (1950 - '64)

It has been attempted to calculate average yearly earnings trends in regards of the employees of Iron & Steel Industry during 1950-'64.

It is preferred to fit a parobolic regression of the order of second degree, only because of the fact that the second difference of the dependent variable (y), defined as,

$$\Delta^2 Y_i = \Delta Y_i - \Delta Y_{i-1}$$

is almost nearly constant and satisfies the conditions for the line of best fit. This is shown in the following Table:

TABLE TWO

Reference Table No.	Regression Used	Regression Equation	Annual Rate	Residual
1	2	3	4	5
9:6	Parabolic	$Y = 5.44 + 0.2t + 0.005t^2$	5.5	2.39
		(Vide Fig. 9:1)		

Source : Table 9:6

where Y, stands for average yearly earnings in terms of money of the persons employed in Iron and Steel Industry, t for time measured in years with reference to 1957 as origin.

Hence, we conclude that our parabolic regression shown by the equation

$$Y = 5.44 + 0.2\,t + 0.005\,t^2$$

represents the best fit line with a positive acceleration and trend amounting 0.005 and 0.2 per annum respectively.

GOODNESS OF FIT TEST:

It is worthwhile to apply the Chi-squared test (χ^2 test) which is a test of the agreement (or consistancy, or confirmity ((38)))between a theoretical (hypothetical) and sample distribution. Karl Pearson's approximation which is shown as

$$\chi^2 = \Sigma\left[(n_i - np_i)^2 \;/\; np_i\right]$$

may be schematically as

$$\chi^2 = \Sigma\left[(O_y - E_y)^2 \;/\; E_y\right]$$

where, O_y is the observe and E_y, expected frequency. As it is clear this χ^2 may be considered as a measure of discrepancy between O_y and E_y. If there is no discrepancy, the $\chi^2 = 0$. Suppose, our sample distribution agrees with the hypothetical distribution. In other words, our nul hypothesis is,

$$H_1 : O_y = E_y$$

The value of χ^2 of the χ^2- test is given by

$\chi^2 =$ 0.413 (Vide Table 9:6). The 5 percent critical value of $\chi^2 =$ 22.4 corresponding to 13 degrees of freedom, is greater than the Computed value of $\chi^2 = 0.413$. The computed value of χ^2 does not lie in between the "regression region" that is $\chi^2 \geqslant 22.4$

CONCLUSION:

(a) Hence, χ^2 for 5 percent level of significance our $\chi^2 = 0.413$ is not significant.

(b) so, our fit is good and there is a great agreement between observed and theoretical value of earnings of the employees of Iron and Steel Industry.

(c) In otherwords, our parabolic line

$$Y = 5.44 + 0.2t + 0.005\,t^2$$

is best fit line to the data of the table 9:6. From Fig.9:1, it is clear that fit is good and error is negligible.

9:5.1 RELATIONSHIP BETWEEN YEARLY WAGE BILLS AND YEARLY VALUE ADDED"

It is interesting to study the total yearly wage payments in relation to the production in money terms(Value added).

A linear regression of X (Total wage bills) on Y(Value added is calculated by the help of least squared method in Table 9:7 which can be seen from the following Table.

TABLE THREE

Reference Table No.	Regression Used	Regression Equation	Annual Rates	Residue
I	2	3	4	5
9:7	Linear	X = 0.571 Y -0.38	2.5	29.06
		(Vide Fig. 9.2)		

Source Table 9:7

The linear regression eqmation represents the best fit and the corresponding equation is

$$X = 0.571\ Y - 0.38$$

which explains X in terms of Y, X being the total ~~value~~ wage bill. Co-efficient of regression is given by $b_{xy} = 0.571$.

It indicates that during 1950-1964 the total wage bill shows an increase in trend rate.

The significance of b_{xy} is tested by the t-test. The relevant value of t is giv n by

$$t = (b_{xy} - \beta_{xy}) \sqrt{(n-2)(Y-\bar{Y})^2 / \Sigma(X-\bar{X})^2}$$

Assuming $\beta_{xy} = 0$ and substituting the value from table 9:7

$$t = 0.571 \sqrt{13 \times 80.17 / 29.06}$$

$$= 0.571 \times 5.98$$

$$= 3.4146 \text{ (Approximately)}$$

which is greater than 5 percent of critical value of $t = 1.771$, corresponding to 13 degrees of freed m. Hence, we reject the null hypothesis, that is $\beta_{xy}=0$ and our empirical regression coefficient $b_{xy} = 0.571$ is significant. Therefore, there is sufficient reason to belive that population ~~exhibits a~~ exhibits a linear relationship between value added and salary and wages. So, increase in wages and salary is not merely due to chance.

9:5.2 RELATIONSHI BETWEEN YEARLY WAGE BILLS & YEARLY VALUE ADDED:

It is interesting to study the total yearly wage payments in relation t the production in money terms(value added).

A linear regression of Y (Value added in 10 Thousands Rs.) on X,(Total wage Bills) is calculated by the help of the least - squared method in Table 9:7, which can be seen from the Table given below:

TABLE FOUR

Reference Table No.	Regression Used	Regression Equation	Annual Rates	Residue
1	2	3	4	5
9:7	Linear	$Y = 1.34X + 1.73$	5.1	80.17
		(Vide Figure 9:2)		

Source : Table 9:7

The linear regression equation represents the best fit and the corresponding equation is

$$Y = 1.34\,X + 1.73$$

which explains Y in terms of X, Y being the value added and co-efficient of regression is given by $b_{yx} = 1.34$

It indicates that during 1950-'64 the value added shows an increasing trend rate.

The significance of b_{yx} is tested by the t-test. The relevant value of t is given by

$$t = (b_{yx} - \beta_{yx}) \sqrt{(n-2) \quad \sum(X-\bar{X})^2 \quad / \sum(Y-\bar{Y})^2}$$

Assuming $\beta_{yx} = 0$, and substituting the various values from Table 9:7

$$t = 1.34 \sqrt{13 \times 29.06 \ / \ 80.17}$$

$$= 1.34 \times 2.15 \ /$$

$$= 2.881 \text{ (Approximately)}$$

which is greater than 5 percent critical value of $t = 1.771$, corresponding to 13 degrees of freedom. Hence, we reject the nul-hypothesis, that is $\beta_{yx} = 0$ and our empirical regression co-efficient $b_{yx} = 1.34$ is significant. Therefore, there is sufficient reason to believe that population exhibits a linear relationship between salaries and wages and value added So increase in value added is not merely by chance.

9:6 CORRELATION BETWEEN WAGES OF WORKERS AND VALUE ADDED:

An attempt has been made to calculate the Karl Pearson's correlation co-efficient between total value added (in M.Rs.) and wages paid to the workers (in M.Rs.) for a period of 15 years from 1950 to 1964 by following formula.

$$r = \frac{\Sigma(xy) - n\,(\Sigma x/n)\,(\Sigma y/n)}{n\sqrt{n\left\{(\Sigma x^2/n)-(\Sigma x/n)^2\right\}\left\{(\Sigma Y^2/n)-(\Sigma Y/n)^2\right\}}}$$

On putting the various values from Table 9:5, the value of 'r' is given by

$$r = \frac{29.77 - (-5)\quad(-14.2/15)}{15\sqrt{\left\{11.74/15 - (-5/15)^2\right\}\left\{92.18/15-(-14.2/15)^2\right\}}}$$

$= 0.78$ (Approximately)

It is worthwhile to test the significance of this correlation co-efficient to strengthen our result. This can be tested by the case of t - distribution, or by the use of nul hypothesis. Here, we will use both t-distribution test and sampling distribution for r.

SIGNIFICANCE OF CORRELATION CO-EFFICIENT 'r'

1) BY USING t- DISTRIBUTION:

The value of t under the hypothesis that correlation coefficient in the population is zero, is given by

$$t = r/\sqrt{1-r^2 / n-2}$$

which has t distribution with = (n-2) degrees of freedom. Putting the various values from Table 9:5, the value of t of test is given by.

$$t = 0.78 / \sqrt{1-(0.78)^2 / 13}$$

$$= 0.78 / \sqrt{0.0261}$$

$$= 4.87 \text{ (Approximately)}$$

which is greater than 5 percent critical value of t = 1.771 for (15-2) or 13 degrees of freedom. The computed value of t

tion and we are inclined to reject the nul-hypothesis, i.e. $\rho = 0$. Hence, the correlation coefficient $r = 0.78$ is significance at 5 percent level.

Therefore, there is a strong correlation between the total value added and wages paid to the workers. It has not arisen due to chance.

ii) <u>USE OF CORRELATION COEFFICIENT TABLE</u>

When $\rho = 0$, we find an exact sampling distribution of 'r', that is, symmetric about zero with a variance r of

$$\text{Variance } (r) = 1 - r^2 / n-2$$

A characteristic of sampling distribution of 'r' is that it depends only on ρ and n. Since we have assumed $\rho = 0$, it means that the sampling distribution depends for this case only on 'n'. Hence, the probable value of 'r' will depend upon the 'n'.

The probable value of 'r' for $\phi =$ (n-2) or (13) degrees of freedom at 5 percent level of significance is 0.5139, which is less than the calculated of 'r'. Therefore, it does not lie in the "acceptance area" that is,

$$P \quad (-0.5139 < r < 0.5139) = 0.95,$$

of r - distribution and we are inclined to reject the hypothesis that $\rho = 0$. Hence, correlation coefficient $r = 0.78$ is significant at 5 percent level.

<u>CONCLUSION</u>:

Therefore, like t-test the significance of 'r' is strongly supported by the r - distribution test. In other words,

the correlation between value added and wages of the workers in the Iron and Steel Industry is significant and it is not merely by chance.

9:7 TOTAL YEARLY EARNINGS, CONSUMERS PRICE INDEX NUMBER AND PRODUCTIVITY

A multiple linear regression of Y (indices of total yearly earnings base 1951), on X_1 (Consumers Price Indices base 1951) and X_2 (Productivity indices base 1951) is calculated by the help of least squared method in Table 9:8

It comes out to be,

$$Y = 1.32\ X_1 - 0.11\ X_2 - 0.104$$

According to the regression equation, the average yearly earnings (Y), increased on an average of 1.32 for each unit of the consumers price index number (X_1). Similarly, the regression co-efficient ~~of~~ X_2 = -0.11, will decrease the total earnings by 0.11 times for every one percent increase in productivity indices. During the period of study, the productivity of the employees has been less effective in influencing the total yearly average earnings of the employees of the Iron and Steel industry as compared to the Consumers Price Index Numbers. The partial regression co-efficients $b_{y1.2}$ and $b_{y2.1}$ are 1.32 and -0.11 respectively. Their significance can be tested by the use of t-test.

SIGNIFICANCE OF $b_{y1.2}$

The value of the t of the t-test is given by

$$t = (b_{y1.2} - \beta_{y1.2}) \sqrt{(n-k-1)\ \Sigma(X_1 - \overline{X}_1)^2 / \Sigma(Y - \overline{y})^2}$$

where $\beta_{y1.2}$ is the corresponding partial regression coefficient in the population from which the regression data have been drawn. We shall test the hypothesis that a change in X_1 in the population does not produce any change in the earnings of the employees. Therefore, the value of t of the t-test is given by,

$$t = b_{y1.2} \sqrt{(n-k-1) \Sigma(X_1 - \bar{X}_1)^2 / \Sigma(Y-\bar{Y})^2}$$

where n = total number of observations, k, number of co-efficients to be determined, and

(n-k-1) = number of degrees of freedom. Putting the various values from Table 9:8, the value of t of t-test is given by,

$$t = 1.32 \sqrt{11 \times .32 / 0.60}$$

$$= 1.32 \times 2.41$$

$$= 3.1812$$

which is greater than the 5 percent critical value of t = 1.796 for 11 degrees of freedom. The computed values of t, therefore, does not lie in the "acceptance area" of the t-distribution and are inclined to reject the nul hypothesis, i.e.

$\beta_{y1.2} = 0$. So our regression co-efficient $b_{y12} = 1.32$ is significant. The change in the average yearly earnings of the employees of the Iron and Steel Industry, as a result of unit change in consumers Price Index, shown by the regression equation is not due to chance.

<u>SIGNIFICANCE OF</u> $b_{y2.1}$

The value of t, under the hypothesis that corresponding partial regression co-efficient $\beta_{y2.1}$, in the population, is

zero, is given by,

$$t = b_{y2.1} \sqrt{(n-k-1) \sum (X_2 - \bar{X}_2)^2 / \sum (Y - \bar{Y})^2}$$

where n and k have their usual meanings.

Putting the various values from table 9:8, the value of t is given by,

$$t = -0.11 \sqrt{11 \times 0.88 / 0.60}$$
$$= -0.11 \times 4.0$$
$$= -0.44$$

which is less than 5 percent critical value of t = 1796 corresponding to 11 degrees of freedom. The computed value of t, therefore, lies in the "acceptance area" of the t - distribution and we are inclined to accept the nul-hypothesis, that is $\beta_{y2.1} = 0$. So our regression coefficient is insignificant. The change in the average yearly earnings of the employees of the Iron and Steel Industry, as a result of unit change in productivity index, is merely due to chance.

CO-EFFICIENT OF MULTIPLE CORRELATION $R_{y.12}$

The coefficient of multiple correlation between the average yearly earnings of the employees of Iron and Steel Industry (Y) on the one hand, and Consumers Price Index Number (X_1) and productivity indices (X_2) on the other, is found to study the combined importance of the latter to the former.

It is given by,

$$R^2_{y.12} = \sum_{=1}^{14} (Y' - \bar{Y})^2 \; / \; \sum_{=1}^{14} (Y - \bar{Y})^2$$

where, Y' is the calculated value of the corresponding X_1 & X_2 . Putting the various values from Table 9:8, the value of $R^2_{y.12}$ is given by,

$$R^2_{y.12} = 0.47 / 0.60$$
$$= 0.783 \text{ (Approximately)}$$

The square of multiple correlation coefficient (also known as co-efficient of determination ((33,38))) indicates that about 78.3 percent of the variations in the average yearly earnings of the employees of Iron and Steel industry (Y) is dtermined by the Consumers' Price Index Number (X_1) and productivity(X_2). The remaining 21.7% of the variation on Y remains unexplain d, is determined by certain other factors like technology,size of establishments, degree of unionization etc., which have not be considered here.

SIGNIFICANCE OF $R^2_{Y.12}$

In order to verify, if this conclusion is also true about the population, from which the regression data are drawn, the significance of $R^2_{Y.12}$ is tested by the help of F-Test. The relevant value of F-test is given by

$$F = \frac{\text{Variance explained by the Regression Equation}}{\text{Residue Variance}}$$

for K and (n-k-1) degrees of freedom, when K is the number of variables eliminated.

The hypothesis being tested is that $\rho_{y.12} = 0$, where, $\rho_{y.12}$ is the co-efficient of multiple correlation in the population. The following table gives the familiar break up summary of variance:

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TABLE FIVE

ANALYSIS OF VARIANCE SUMMARY FOR THE OBSERVED REGRESSION DATA

Source of Variation	Sum of Squares	DEGREES OF FREEDOM	Mean Squares
1.	2.	3.	4
Total	$\sum_{1}^{14}(Y - \bar{Y})^2$ = 0.60	$(n - 1)=13$	$\sum_{1}^{14}(Y' - \bar{Y})^2 / k$ = 0.47/2
Linear Regression	$\sum_{1}^{14}(Y' - \bar{Y})^2$ = 0.47	$k=2$	= 0.285
Residue from Regression	$\sum_{1}^{14}(Y - Y')^2$ = 0.10	$(n-k-1)=11$	$\sum_{1}^{14}(Y-Y')^2/n-k-1)$ = 0.10 / 11 = 0.009

Source -- Table 9:8

Therefore the value of F-of the F-Test is given by,

$F = 0.285 / 0.009$

$= 31.6$ (Approximately)

which is greater than the 5 percent critical value of $F=3.98$, corresponding to 2 and 11 degrees of freedom. The F-ratio is significant. The computed value of $F=31.6$ lies in the "rejection region" of the F-distribution. The hypothesis $\rho_{y.12}=0$ is therefore, rejected . This means that in the population, the variance in the total average yearly earning(Y) is accounted for by linear regression on Consumers Price Index Number (X_1) and the productivity Index Number (X_2). The conclusion about $R^2_{y.12}$ is therefore, strengthened and is not due to chance only.

9:8 SIZE OF ESTABLISHMENT - PRODUCTION CAPITAL WAGES AND PRODUCTIVITY:

The Iron and Steel industry shows a peculiar trend, when we analyse the figures of productive capital requirement per person in respect of the size of establishment. It was Rs. 9895 for the group below 20 and shows a declining tendency upto the group 50-99. It was Rs. 10015 in the group 100-249 which has again declined. It was highest Rs. 25230 in the case of group 5000 and above. It is obvious from the above fluctuations, that where heavy and technically advanced machines and method of production are applied, productive capital requirement is higher and productivity too is higher. On the other hand, it is not possible for lower unit of production to apply the heavy and costly machines, so their productive capital requirement is less. In the large establishments, skilled technicians and apprentices are found employed who demand higher salaries and advanced machine to work with resulting in large productive capital requirement.

Labour productivity in this industry bears a close association with the size of establishment. It increases with the increase in size of establishment which can be seen from Table 9:10

In order to establish the validity of the above statement, and attempt has been made to calculate a linear logarithmic regression of the production (Value added, Y) on productivity (X, defined as P/W, where P and W are the productions and number of workers respectively), by method of least-squared in table 9:9. The summary of the analysis Table is given on the next page.

TABLE SIX

Reference Table No.	Regression used	Regression Equation '*'	Rate	Residue
1.	2	3	4	5
9:9	Linear Logarithemic Regression	$Y = 2.16\ X - 0.0236$	5.6	22.56

(Vide Figure 9:3)

Source : Table (9:9, 9:10)

'*' $X = \text{Log } P/W$, $Y = \text{Log } P$

Linear regression shown by equation,

$$\text{Log } P = 2.165 \ \text{Log } P/W - 0.0236$$

represents the best fit line.

It is worthwhile to apply t-test to test the significance of b - the least squared regression co-efficient as obtained by the best fit regression equation. By supposing $\beta = 0$, we may test the hypothesis that, in the population, the regression co-efficient is zero. This means that there is no relationship between Log P and Log P/W (i.e. Y and X), in the population.

The value of t of the t-distribution is given by,

$$t = (b - \beta) \sqrt{(n-2)\ \Sigma(X-\bar{X})^2 \ / \ \Sigma(Y-\bar{Y})^2}$$

The quantity t follows the so called t-distribution with (n-2) degrees of freedom, n- being the numbers of observations, because two constants have been eliminated from the data.

Therefore, on putting the various values from Table 9:9, the value of t is given by:

$$t = 2.165 \sqrt{(7 \times 0.59) / 22.56}$$

$$= 2.165 \times 0.4$$

$$= 0.866$$

which is lesor than the 5 percent critical value of t = 1.895 for 7 degrees of freedom. Hence, we accept the null hypothesis i.e. $\beta = 0$ and our empirical regression co-efficient b =2.165 is insignificant. It is concluded therefore, that our conclusion is merely to the chance.

9:9 PROFITS:

Wages of the employees of any industry greatly depend on the financial position of the industry, in other words, on the "capacity to pay" of the industry. In this connection the following observations made in the "PROBLEMS OF WAGE POLICY IN ASIAN COUNTRIES", (Indian Labour Organisation Studies & Reports, New Series, No. 43, 1956 Page 87) is also significant.

> "The simple statement that certain minimum wage would be beyond industry's capacity to pay has little meaning. Any judgement concerning the capacity to pay must necessarily be based on some explicit or implicit set of standards pertaining to
>
> (a) the anticipated effects of the introduction of a given minimum wage rate of prices, profits employment, etc., and
>
> (b) the evaluation of these effects in terms of social and economic policy".

Thus the study of various criteria like,

(a) Capital Formation

(b) Reserves and Sur luses

(c) Capital Assets;

(d) Sources and uses of funds,

(e) Profit after tax as a percentage of net worth,

to assess the financial position of the industry add its capacity to pay, ma, be es entially useful in getting an objective picture.

In the light of the availability of the date, we propose to examine the present position of the iron and store industry on the basis of profit data; which is one of the important factors in the determination of 'capacity to pay' of the Industry.

Though, the report of the committee on Fair wages states that the capacity of the industry to pay should be judged on an industry-cum-region basis after taking a fair cross-section of the industry; But, since the profit data are not available for all the four companies separately, the profitability ration will be studied as a whole.

The Reserve Bank of Indi a, has studied the profitability ratio in three separate seri s —(i) from 1950-'61 to 1955-'56, (ii) from 1955-'56 to 1960-'61 and (iii) from 1960-'61 to 1962-'63 taking two companies into consideration in each of the series respectively on the basis of balance sheet figures ¢( )). Unlike other industries studied earlier, it will be easier here to present a whole study for the period of 14 years from 1950-'51 to 1962-63.

It has been pos ible only because of the fact that companies studied in all the three series remains the same. It may be possible that companies studied in all the three series are different. In that case data will not be strict comparable But here we suppose that the companies studied are the same and thu the date of the three series are comparable and a trend for a period of 14 years way be easily drawn.

Another important oint in this connection is that we will study the profitability ration under three broad heads viz., i) Profits before Tax, (ii) Profits after tax and (ii) Profits as a percent of net worth.

9:9.1 PROFITS BEFORE TAX (VIDE TABLE 5:9.11-A)

Profit before tax shows an increasing trend through out the period of study. It has increased 3.5 folds in 14 years from 1950-'51 to 1962-'63. A close analysis of the data shows that it has followed an increasing trend in the first series, decreasing trend(slight) in second and again increasing in third series. The minimum and maximum profits are Rs. 595 lakhs and Rs. 1979 lakhs respectively.

9:9.2 PROFITS AFTER TAX (VIDE TABLE 5:9.11-c)

Like profits before tax, it also shows an increasing trend through out the study period. There has been an increase of 4.7 folds from 1950-'51 to 1962-'63, within a period of 14 years, the amount of profits being Rs. 352 lakhs to Rs. 1543 lakhs respectively when studied separately. it shows an increasing trend in the first series, decreasing

in the second and again increasing in the third, respectively. The minimum and maximum amounts being Rs. 352 lakh and Rs1543 lakh in the years 1950-'51 and 1962-'63 respectively.

9:9.3 PROFITS AS A PERCENTAGE OF NET WORTH:

Although it follows the same path as followed by the two sections of the study described above, the increase is very small, viz. 1.2 times from 1950-'51 to 1962-'64 which is very small in comparison with the above two studies. Again it follows the same path of increase, decrease and increase in the first the second and the third series, respectively. This time the maximum and minimum percentages are in the first series, percentage being 22.6 and 10.3 in 1955-'56 and 1950-'51 respectively.

Apart from this, on the recommendation of Tariff Comm' regulated

rice, namely

that part of the sale price, which the producers are allowed to retain, and also the rate of profit. Cost-price structure recommended by the Tarriff Commission has also very much affected the profit in the case of Iron and Steel Industry.

9:10 CONCLUSIONS:

On the basis of the above study the following infernces can be drawn:

(a) the total earnings of the employees in the period 1950- to 1964 follows a parabolic trend given by,

$$Y = 5.44 + 0.2\ t + 0.005t^2$$

which has an average trend of 0.2(yearly) and an acceleration of the order of .005 per annum. (Vide Section 9:4).

The error (Vide Fig 9:1, Table 3:6) is cyclical, which may be caused due to the payments of arrears, bonuses, interium beliefs recommended by Tarriff Commissions and Central Wage Boards from time to time.

(b) total wage bill bears a linear relationship with value added. Its trend values are positive. So it is concluded that not only wages(wages and salaries and money value of benefits) of the employees of the Iron and steel Industry explain the value added but value added also explains the wages and salaries. (Vide Section 9:5.1 and 9:5.2)

(c) there is a strong correlation between total value added and wages paid to the workers. In other words, production in Iron and Steel industry greatly depends on the wages paid to the workers(Vide 9:6)

(d) the multiple correlation coefficient is highly significant. Hence, considered, together the Consumpess Price Index and Value added per person (i.e. productivity) satisfactorily explain total earnings of the employees of the Iron and Steel Industry. However, after the elimination of productivity ($(b_{y1.2})$, Consumers Price Index number explains the total earnings

satisfactorily, whereas, if we donot consider the effect of Consumers' Price Index ($b_{y2.1}$), the productivity does not explain the total earnings (Vide Section 9:7)

(e) the linear logarithmic equation does not support the above conclusion that production bears a positive correlation with productivity as the size of establishment increases. It is merely due to chance.

We may conclude that the Iron and Steel Industry, is a basic and profit earning industry and that, if it is managed properly, it can solve the unemployment, problem of the country. It can meet the needs, of the foreign exchange problem of the country.

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CHAPTER TEN

SUMMARY & CONCLUSIONS

10:1 Uptil now the study was of individual industries, one chapter was devoted to each industry, in which characteristics of the industry, employment-structure, wage-structure, productivity and profits were studied. It would now be interesting to study all the industries taken together. For this purpose we make the use of statistics relating to wages and earnings and value added available for a period of 15 years from 1950 to 1964. The statistics which have been used here for this purpose, have been taken from the Census of Manufactures and Annual Survey of Industries from 1950 to 1964. The data suffers from certain limitations (which have been discussed in Chapter I) and a comprehensive picture can not be presented. But since the pay range must be assumed to cover broadly the same ranges of skill, experience and training, a study of the per capita earning in the different parts of the country and in different industrees will provide use the pproper perspective on inter-industry wage-differentials.

In section 10:2, we present the data of average annual earnings per person(employee), wages per worker (men, women and Children all), wages for other than workers for different years from 1950 - 1964.

These figures of annual earnings are an overall average of the earnings of men, women and children. Besides, the fact that this is a simple average of variety ofrates shows that it is not a very good measure to use . But, in the absence of any other data, there is really no choice.

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These give us some indication of the level of earnings of the workers and other than workers for different industries in the period of 1950-'64. In Section 10.3 we will present the interstate wage differentials. In the Section 10:4 and 10:5, productivity, calculated by dividing the value added by total employment, and profits after tax have been presented. Since Value added does not exclude the production of machines and non-workers (i.e. of ministerial and administrative staff), it cannot, strictly speaking, be considered productivity of labour. Even then in the absence of other measures of productivity, we have used it frequently. In case of profitability Reserve Bank of India studies ((77)) have been used.

10 : 2 EARNINGS BY INDUSTRIES:

Table One shows a general trend towards a rise in earnings. All the industries registered a comparatively higher level of earnings, in 1964 than in 1950. In the period under consideration, the average yearly earnings were highest in Iron and Steel Industry, followed by Paper and Paper Boards. It was lowest in the Sugar Industry. It may be due to the seasonal nature of the Sugar Industry. The ranking of the industries in accordance with the level of average annual earnings shows that Paper and Paper Boards, Iron and Steel, Matches, Cotton Textiles, Cement, Woollen Textile, Jute Textile and Sugar Industry occupied higher ranks in 1963, when compared to 1950.

On the basis of average earnings over the 15 years, 1950 - 1964, the ranking may be like Table Two.

TABLE ONE

'WAGE STRUCTURE OF DIFFERENT INDUSTRIES FROM 1950 – '64'

(In Rs. 000' / Yearly)

...r	1950	'51	'52	'53	'54	'55	'56	'57	'58	'59	'60	'61	'62	'63	'64
...RY															
...s	2.8	3.0	3.4	3.7	3.9	3.9	3.8	4.1	4.2	4.3	4.6	6.0	6.7	7.4	6.5
...f workers	0.9	0.9	1.1	1.4	1.3	1.2	1.1	1.1	1.2	1.3	1.4	2.4	2.6	3.1	2.1
... non-workers	1.8	2.0	2.2	2.4	2.5	2.5	2.6	2.8	2.8	2.7	3.0	2.3	3.7	3.[illegible]	4.0
...alue of benefits etc.	.07	.09	.09	.10	.13	.17	.18	.23	.22	.27	.24	.30	.36	.43	.41

COTTON TEXTILE INDUSTRY

...s	3.4	3.8	4.1	4.1	4.0	3.9	3.7	4.3	4.3	4.5	5.0	5.6	6.4	6.4	6.4
...f workers	1.1	1.2	1.3	1.3	1.3	1.2	1.3	1.4	1.4	1.4	1.6	1.7	1.9	2.0	2.0
...f non-workers	2.3	2.6	2.8	2.8	2.6	2.6	2.3	2.8	2.8	3.0	3.3	3.8	4.3	4.5	4.3
...alue of benefits etc.	.01	.01	.01	.02	.03	.08	.08	.09	.10	.13	.15	.16	.17	.20	.20

WOOLLEN TEXTILE INDUSTRY:

...gs	3.5	3.9	3.9	4.0	4.8	4.0	3.9	3.9	4.3	4.0	4.5	5.0	4.8	5.2	5.8
...f workers	0.9	1.1	1.0	1.1	1.1	1.0	1.0	1.1	1.1	1.1	1.2	1.2	1.3	1.4	1.6
...f non-workers	2.5	2.8	2.9	2.9	2.7	2.7	2.[illegible]	2.7	3.0	2.8	3.1	3.7	3.4	3.6	4.0
...alue of benefits etc.,	.02	.03	.05	.05	.07	.13	.08	.08	.10	.10	.12	.12	.14	.15	.20

JUTE TEXTILE INDUSTRY:

...s	2.8	2.8	2.2	2.3	2.3	3.4	3.5	3.6	3.6	3.6	3.8	3.8	4.0	4.1	5.0
...f workers	0.8	0.8	0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.0	1.1	1.2	1.2	1.3	1.4
...f non-workers	2.0	2.0	2.3	2.3	2.3	2.3	2.5	2.6	2.6	2.5	2.5	2.5	2.7	NA	3.5
...alue of beneifts etc.,	.02	.02	.02	.02	.02	.03	.03	.03	.03	.09	.10	.10	.09	NA	.20

'*' Figures are rounded off.

(Table I Contd.)

TABLE ONE (Contd.)

'WAGE STRUCTURE OF DIFFERENT INDUSTRIES FROM 1950 - '64)
(In Rs. 000' / Yearly)

r±	1950	'51	'52	'53	'54	'55	'56	'57	'58	'59	'60	'61	'62	'63	'64
SUGAR INDUSTRY															
s	1.8	2.0	2.0	2.0	2.2	2.2	2.4	2.3	2.4	2.4	3.0	3.3	3.8	4.0	4.2
f Workers	0.5	0.6	0.6	0.6	0.7	0.7	0.8	0.7	0.8	0.8	1.1	1.3	1.4	1.5	1.5
f non-workers	2.4	2.9	3.2	3.1	2.8	3.1	3.0	3.9	3.0	3.6	3.2	4.8	4.3	4.1	5.2
alue of benefits etc.,	.04	.05	.04	.05	.05	.07	.09	.08	.08	.08	.11	.10	.11	.19	.19
MATCH INDUSTRY															
s	3.7	3.9	3.8	3.5	3.7	3.6	4.4	4.0	5.1	4.9	5.6	6.2	6.7	7.0	6.8
f workers	1.0	1.2	1.1	1.2	0.9	0.9	1.	1.1	1.2	1.2	1.3	1.5	1.6	1.8	1.8
f non-workers	2.5	2.6	2.6	2.2	2.6	2.8	3.4	2.3	2.9	2.6	4.3	4.6	4.	4.9	4.7
alue of benefits etc.,	.14	.15	.09	.14	.11	.04	.05	.06	.06	.11	.12	.14	.18	.22	.23
PAPER AND PAPER BOARDS:INDUSTRY															
s	3.4	4.0	4.3	4.2	3.8	4.2	4.2	4.2	4.3	5.1	4.5	6.1	6.6	7.0	7.8
f workers	0.9	1.0	1.1	1.0	1.0	1.0	1.1	1.1	1.2	1.4	1.2	1.2	1.2	1.7	1.4
non-workers	2.4	2.9	3.2	3.1	2.8	3.1	3.0	2.9	3.0	3.6	3.2	4.8	4.2	4.1	5.2
alue of benefits	.04	.05	.04	.05	.05	.07	.09	.08	.08	.08	.11	.10	.11	.19	.19
IRON AND STEEL INDUSTRY															
s	4.2	4.5	4.9	5.0	4.7	4.8	4.3	5.3	5.8	6.4	6.6	6.7	6.3	6.2	7.5
f workers	1.5	1.8	1.9	1.8	1.8	1.8	1.9	1.8	1.9	2.2	2.3	2.4	2.1	2.5	2.6
f non-workers	2.7	2.6	2.0	2.0	2.8	2.9	3.2	3.2	2.6	3.8	3.9	4.0	4.0	3.3	4.5
alue of benefits etc.	.06	.10	.11	.11	.14	.16	.17	.25	.15	.35	.38	.36	.28	.3	.36

'*' Figures are rounded off.

Source: Table 2:2, 3:2, 4:2, 5:2, 6:2, 7:2, 8:2, & 9:2

So far as the average yearly earnings are concerned, the first rank is occupied by Iron and Steel Industry through out the period of study excepting the years 1954, 1956, 1962, 1963 and 1964, in which it ranks second, second, fourth, fourth and second respectively. First ranks in these years were occupied by Woollen Textile Industry((1954) match Industry (1956) and Paper and Paper Boards Industry(1964)respectively. The reason of its being on the top may be attributed to the nature of the employment. Majority of the workers are highly skilled and trained (specialised), who are highly paid ((See Section 9;3 & 68, 73)).

The rank of Paper and Paper Boards Industry varies first to fifth through-out the period of 15 years under study.

Cement Industry has occupied either fourth or fifth place through out the period excepting years 1962 and 1963, in which its rank is first.

So far as the textile group of industries is concerned Cotton Textile Industry is on the top(in an average) occupying the ranks ranging between second to fifth.

The range of ranks in Woollen Textile Industry is Third to sixth excepting the year 1954, in which it occupies the highest rank.

The Jute Textile industry occupies the lowest ranks in majority of years. It had occupied the place from 5th to 7th.

TABLE TWO

TABLE SHOWING RANKS OF DIFFERENT INDUSTRIES ACCORDING TO MAXIMUM TOTAL YEARLY EARNINGS (1950 - 1964)

SY/ S	Cement	Cotton Textile	Woollen Textile	Jute Textile	Sugar	Matches	Paper & Paper Boards	Iron & Steel
0	V	IV	III	V	VI	II	IV	I
1	V	IV	III	VI	VII	III	II	I
2	VI	III	IV	VII	VIII	V	II	I
3	V	III	IV	VII	VIII	VI	II	I
4	IV	III	I	VII	VIII	VI	V	II
5	IV	IV	III	VI	VII	V	II	I
6	V	VI	IV	VII	VIII	I	III	II
7	IV	II	VI	VII	VIII	V	III	I
8	IV	III	III	V	VI	II	III	I
9	V	IV	VI	VII	VIII	III	II	I
0	IV	III	VI	VII	VIII	II	V	I
1	IV	V	VI	VII	VIII	II	III	I
2	I	III	V	VII	VIII	I	II	IV
3	I	III	V	VII	VIII	II	II	IV
4	V	IV	VI	VII	VIII	III	I	II

Source: Compiled from Table One

Sugar, the agro-based industry occupied the lowest i.e. eighth in majority of years excepting years 1950 and 1958, in which its rank had been sixth. The reason of its low earnings are that majority of the workers are unskilled and work on the daily basis in the field of Sugar-cane. Skilled and highly trained workers are less in number.

Though, Match Industry is an industry of an unorganized nature, being neglected by the Government, even then it has occupied the ranks ranging from First to sixth. Within a period of fifteen years it has occupied first place, twice, five times second place, thrice third and fifth place each and twice sixth place.

Thus, it is clear from the table that Iron and Steel Industry (a Capital intensive industry) and Sugar (an agrobased industry) occupy highest and lowest positions respectively, in the period of analysis in the case of average yearly earnings.

From table one, it is clear that the ministerial staff (non-workers) were getting double the average wage of workers in the case of Cement; Cotton Textile Industry; two and half times in the case of Woollen; and Jute Textile; Three times in the case of Match; approximately three & half times in case of Paper and Paper Boards Industry. In the case of Iron and Steel Industry this ratio is approxi- ~~metely~~ mately 1:1.75. So far as the case of Sugar Industry is concerned, this ratio decreases from 1:5 to 1:3 as time passes from 1950 to 1964. This is only

because of the fact the workers of this industry are low paid agricultural labourers, whose conditions of welfare were not being considered in the earlier period of the study. As the time passed, the e workers were also given due importance and their welfare and wages were also considered

TABLE THREE

WAGE RATIO OF WORKERS & NON-WORKERS AND CO-EFFICIENT OF VARIATIONS IN WAGES (1950-'64)

y	Cement	Cotton Textile	Woollen Textile	Jute Textile	Sugar	Match	Paper & Paper Boards	Iron & Steel
	2	3	4	5	6	7	8	9
, Non- , earnings	1:2	1:2	1:2.5	1:2.5	1:5 to 1:3	1:3	1:3.5	1:1.75
ient of ons in	0.58	0.27	0.40	0.44	0.37	0.17	0.31	0.54

Source: Compiled from table 2:2 to 9:2 and from Table 1 of the above section.

Similarly, if we throw a galnce at the table 3 (above), we find that the co-efficient of variation in wages is highest (0.58) in the case of cement industry followed by Iron and Steel Industry(0.54) and lowest (0.17) in the case of Match Industry followed by the Cotton Textile Industry (0.27) respectively.

We have data regarding the ranksof the first six industries for Sweden(1952), Canada(1945), and the U.S.A. (1954). It is not the best comparison one can make but the differentials as between the various industries in these

three Countries are interesting.

TABLE FOUR

INTER-INDUSTRY EARNINGS DIFFERENTIALS IN INDIA, SWEDEN, U.S.A., AND CANADA

	INDIA		SWEDEN	U.S.A.	CANADA
y	1956-'63	1956-'63 '*'	(1952)	(1954)	(1945)
	2	3	4	5	6
	100.00	100.0[illegible]	100.00	100.00	100.00
	86.00	92.0[illegible]	85.00	66.70	90.90
	81.00	88.22	81.00	66.20	86.[illegible]
	80.00	86.[illegible]5	80.00	64.70	81.40
	80.00	84.20	78.60	63.80	81.40
	77.80	74.45	76.60	63.78	81.40
	NA	63.02	NA	NA	NA
	NA	49.48	NA	NA	NA

<u>Source:</u> (((,10, p 13; 31 pp 1-13)).

The comparision, of course, does not say anything regarding the absolute level of earnings in the respective countries. It may also be that industries ranked below the sixth may have a different earnings pattern.

If we consider onl, eight industries and study the average of average yerly earnings for a period of 1956-'63

'*' This is computed by taking the average earnings rank from 1956 to 1963. i.e. total of all the average earnings from 1956 to 1963 and dividing by 8 (no.of years) and then considering highest rank as 100 and calculated for other ranks for all the industries under study.(Vide Table 2).

it is again clear that the variation in the case of India is narrower than other countries, when only six industries ranks are considered.

We turn now to a study of the pattern of Wages of the workers(as defined in Chapter I) and other than workers (i.e. ministerial and administrative staff) for the period of 1950 to 1964. The above study done in the previous two sections presents the anal is of wages and earnings of the workers (See Table Three).

There has been an increase of six times from 1950 to 1964 in the average money value of the beneifits and privileges in the case of Cement Industry. The corresponding value for Match Industry is 1.25, 4 for Paper and Paper Boards, 5 for Sugar, 24.5 for Cotton, 8 for Woollen, 6.5 for Jute and 5 for Iron and Steel Industry (Vide Table One), These show that there is a significant increase in the benefits and privileges, this has been due to the Government intervention or bargaining powers of the labourers.

Inter-industry wage structure, is determined by the ability to pay. The ability to pay is measured by the following four variables:

(1) Average daily earnings (A.D.E.)

(2) The ratio of the Gross profits(Net Value added + Depreciation - (Wages + Salaries + Money value of beneifts,) to gross sale proceeds, (GPR)

(3) The ratio of value added to total man-days. It is a measure of labour productivity(L.P.)

(4) The ratio of contract labour to total labour.

It is taken as a crude measure of the skill components of labour force(C.L.P.).

(5) The ratio of the w ge costs to value added (W.C.R.).'*'

10:2.1 EMPIRICAL SETTING AND THEIR ANALYSIS:

It will now be interesting to present some of the findings of Dr. C.K.Jauhari and N.C.Agrawal. As stated earlier, the date on the dependent and the explaining variables are grouped in four periods. Simple, partial and multiple correlation, coefficients or computed separately for each period. The techniques of Pearson's product moment correlation coefficient has been used to test the selectionship between the mean of average daily earnings of 29 industries (in our case for 8 industries) and the explaining variables. It is assumed, first, relationship is liniar, and second, that the explaining variables are not related to each other.

Here, it would not be out of place to compare the findings of Dr. C.K.Johri and N.C.Agrawal with the results of our own. We have calculated multiple correlation, coefficient betweem total yearly earnings as independent

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'*' From the article of Dr. C.K.Jauhari and N.C.Agrawal, "Inter Industry Wage Structure in India, 1950-'61 — an Analysis". It is clear that average daily earnings will be the measure of wage structure of the industries. It is also cleear that average daily earnings and IInd and IIIrd factors are positively related, whereas IVth and Vth negatively.

variable and Consumers Price Index Number and Productivity as dependent variables. The period covered by our analysis is 1951 to 1964 (Vide Table 11,12,(a), 12(b),(12(c)) The coefficient of multiple correlation obtained by us for each industry is greater than the coefficient of correlation obtained by Dr. C.K.Jahari and N.C.Agrawal for all industries (29), except in the case of cement. Though, they are not strictly comparable but in the absence of the materials there is no hard to attempt such study.

The only common independent variable is labour productivity. A comparison with Johari study shows that the coefficient of simple correlation between total earnings and productivity for the whole period as calculated by us for individual industries are greater than these calculated by them for different periods.

10:2.2 WAGES AND PROFITABILITY:

From the table 5, it is revealed that wages and profitability are farely closely related to each other. The simple correlation coefficient between them are +.37, +.30 and + .57 for the periods 1950-'52, 1953-'55 and 1956-'58 respectively and barring the second period, are significant at 0.05 percent ~~lvel~~ level. The last value is even significant at 0.01/level. With the exception of the period 1950-'52, the partial correlation coefficient also reveals a strong relationship between wages and profitability. Thus both the simple and partial correlation clearly show that wages and profitability are significantly related to each other.

There is however a sharp increase in the correlation in the period 1956-'58, as compar d to the period 1953-'55. This can be explained by the development of inflationary pressures during 1956-'58, w ich have continued ever since, During the inflationary conditions there is two fold tendency for wages to go up (i) worker demand higher wages, because it becomes constlier to meet the daily needs of lifes and (ii) the employers' demand for labour goes up because they went to produce more to make the best out of the situation. On the other h nd, in view of increasing profits it is possible for employers to pay more through either dearness allowance or bonus or both.

10.2.3 WAGES AND LABOUR PRODUCTIVITY:

The value of the simple correlation coefficient between wages and labour productivity for the period 1950-'52, 1953-'55 1956-'58 are 0.61, 0.59 and 0.55 respectively. All of these are significant at the 0.01 level. Although the association of wages and labour productivity is strong, it seems to be decreasing over the period. Partial correlation coefficients show even closure relationships between wages and productivity. Their values are 0.59, 0.73 and 0.58 for the consequent periods. These values in our case for 1951-'64, for Cement, Cotton Textile, Woollen Textile, Jute Textile, Sugar, Match, Paper and Paper Boards and Iron and Steel Industry are 0.579, 1.01, -0.102 0.03, 0.77, 0.47 0.21 and -0.11 respectively ((Vide Table 12.b)), which are greater in the case of Cotton Textile and

Sugar Industry excepting the Cement, Woollen Textile, Jute Textile, Match, Paper and Paper Boards and Iron and Steel Industry, in which the values are lower than the partial correlation coefficients~~of~~ obtained by Dr. C.K.Jauhari and N.C.Agrawala. The value of partial correlation coefficient is higher than that of simple correlation coefficient. However, the partial correlation coefficient behave erratically over the period. Even then the high value of both, simple and partial correlation coefficient provides sufficient statistical evidence in support of our hypothesis of close association between wages and labour productivity.

10:2.4 WAGES AND IMPORTANCE OF WAGE COSTS: (Vide Jauhari's Articl

The values of simple correlation coefficient between wages and wage cost to value added are + 0.04, -0.14 and -0.03 for the periods 1950-'52, 1953-'55, 1956-'58. None of these are statistically significant. For the first period even though the value of correlation coefficient is close to zero, the sign is unexpectedly positive. Similarly, in the third period, the sign is correct but value is nearer to zero. However the values of partial correlation coefficient are very high. There appears to be two explanations for such high positive values of partial coefficients;

(a) There is probably stron multi collinearity between labour productivity and wage cost ratio.

(b) It is also probable that the growing labour

legislation has upset the supposed relationship. These legislations are socially justified in order to ensure workers a minimum bundles of necessary goods.

Moreover, inflation over this period have contributed to increase in the wages. The real implication of this is that such externally - induced wage increases have directly increased the ratio of wage cost to value added. Thus, wages might have become a causal factor in the wage to 'wage-cost' relationship. Rather than the lowness or highness of the wage cost ratio affecting the wages, it is the wages themselves which affect the wage cost ratio. This clearly shows that in situations which are peculiar to a country like India, i.e. where wages also depend upon external factor, the negative relationship between wages and wage cost ratio can not be obtained. In fact, the chain of causality between these two variable stands reversed.

10:2.5 MULTIPLE CORRELATION COEFFICIENT:

The multiple correlation coefficient gives the evidence regarding the magnitude of variations in the dependent variables which can be ascribed to the explaining variables. The value of multiple correlation coefficient between Average Daily Earning and all other four explaining variables taken together are + 0.74, 0.77 and 0.84 for the periods 1950-'52, 1953-'55, and 1956-'58 respectively. All of these are significant at 0.01 level of significant with five variables. This means that quite a large-part

TABLE FIVE

STATEMENT SHOWING CORRELATION COEFFICIENTS BETWEEN AVERAGE DAILY EARNINGS AND EXPLAINING VARIATIONS

	195[illegible]-'52	1953-'55	1956-'58	1959-'61
Simple correlation coefficient between Avera e daily wages and				
1. Gross Profitabi ity ratio	+ 0.37	+ 0.30	+ 0.57	+ 0.10
2. Labour roductivity	+ 0.61	+ 0.59	+ 0.55	+ 0.27
3. Contract Labour Ratio	- 0.24	- 0.19	- 0.25	- 0.28
4. Wage Costs ratio	+ 0.04	- 0.14	- 0.03	+ 0.17
Partial Correlation coefficient between average daily earnings and ~~variables~~ variables				
1. Gross Profitability Ratio	+ 0.04	+ 0.31	+ 0.51	+ 0.20
2. Labour Productivity	+ 0.59	+ 0.73	+ 0.66	+ 0.33
3. Contract labour Ratio	- 0.03	- 0.10	+ 0.18	- 0.03
4. Wage costs Ratio	+ 0.50	+ 0.57	+ 0.58	+ 0.31
Multiple correlation Coefficient between Average Daily Earnings and all the explaining variables	+ 0.74	+ 0.77	+ 0.08	+ 0.43

Source : Dr. C.K.Jauhari and N.C.Agrawal, - "Inter-Industry Wage-Structure in India, 1950-'61 - An Analysis"

of the total variations in inter-industry earnings, over the pèriod 1950-'58, can be explained by the four vaxi avles, viz. profitability, labour productivity, contract labour ratio ratio and wage cost ratio. The trend of multiple correlation coefficient rising over period 1950-'58, which implies that the theoretical model envisaged in this paper has gradually become a better fit for explaining the variations in the inter-industry wage structure in Indian industries.

10:2.6 THE ANALYSIS OF THE PERIOD 1959-'61:

As pointed out earlier, it has been decided to analyse the period 1959-'61 separately because its covering is restricted to enterprises employing 50 or more persons with power and 100 or more persons without power, because the date for the earlier period included enterprises employing 20 or more persons with power only. In other words, the data for the period 19 1959-'61, covers relatively larger enterprises The statistical results for this period are probably affected by this difference in covering. Inflation has been also a cause for this difference. The analysis for this period has been presented in all the individual chapters in the section of wage structures. (See Analysis for Census of Manufacturers and Annual Survey of Industries in each Industry)

10:3 INTER - INDUSTRY PRODUCTIVITY:

To measure the productivity of the employees, per capital value added has been calculated by dividing total yearly value added by total yearly employment. From the Table Six it is clear that the productivity has increased in

TABLE SIX

INTERINDUSTRY PRODUCTIVITY (1950 -'64)

(Rs. in '000)

ustry/ r	Cement	Cotton Textile	Woollen Textile	Jute Textile	Sugar	Paper & Paper Board	Iron & Steel	Matche
0	3.3.	1.6	2.8	1.4	1.9	2.2	3.3	2.5
1	3.3.	2.2	2.9	1.9	1.9	3.3	3.4	2.6
2	4.4	1.7	1.7	1.6	1.8	3.3	3.9	2.6
3	4.7	1.9	2.0	1.5	1.9	2.7	4.3	2.7
4	5.8	200	1.9	1.5	2.3	3.2	5.0	2.1
5	5.[illegible]	2.2	2.3	1.4	2.4	4.0	5.0	1.7
6	4.2	2.3	2.3	1.8	2.3	3.8	6.3	2.3
7	4.2	2.0	2.8	1.5	2.5	3.9	5.7	2.2
8	4.2	2.1	3.1	1.7	2.7	6.5	5.2	3.4
9	4.[illegible]	2.2	3.3	1.9	2.4	5.0	5.4	2.0
0	4.7	2.7	3.1	1.6	3.3	3.3	5.2	3.0
1	5.3	3.0	3.7	1.5	3.7	5.3	5.2	3.7
2	6.5	3.0	4.0	2.4	2.6	3.8	5.4	3.7
3	6.3	3.0	4.0	2.3	3.6	4.8	5.3	3.8
4	6.0	3.3	3.9	2.1	3.9	6.1	6.6	3.6

Source: Table 2:2 to 9:2

industries in the period 1950 to 1964 in Cotton Textile, Woollen Textile, Sugar, Paper and Paper Boards and Iron and Steel Industry except in Cement, Jute Textile and Matches. It has doubled from 1950 to 1964 in the above mentioned industries except in Cement, Jute Textile and Matches.

10:4 PROFITS AFTER TAX

Here we will present the data of profits after tax for the period 1950-to 1964 in three separate series for all the eight industries on the basis of Reserve Bank of India's study. ((77)). Since these three series of profits data are calculated for different number of industries, so they can not be strictly compared. From the Table Seven, it is clear that the most profit ~~even in~~ earning industry in the 1950-'51 to 1962-'63 has been Cotton Textile followed by Iron and Steel. Woollen and Jute Textile industry has shown several times losses too.

The profit margin of the Match and Paper and Paper Board Industry has been Rs. 45 and Rs. 118 Lakhs in 1950-'51 which has increased upto Rs. 78 and Rs. 301 lakhs in 1962-'63. It is also due to the increase in number of industries.

TABLE SEVEN

PROFIT AFTER TAX (In Lakh Rs.)

ry7	Cement	Cotton Textile	Woollen Textile	Jute Textile	Sugar	Matches	Paper & Paper Boards	Iron & Steel
SERIES - I								
51	197	840	25	377	193	45	113	352
52	236	1315	14	566	326	43	168	553
53	255	296	4	107	236	51	156	594
54	225	532	2	234	293	41	150	585
55	260	528	27	321	2[illegible]0	41	127	817
56	299	1263	129	163	332	39	196	1149
SERIES-II								
56	359	1504	129	40	287	37	208	1115
57	355	1408	146	-182	394	36	137	963
58	294	- 192	118	132	390	16	173	955
59	244	69	146	340	361	44	270	1088
60	389	1168	441	581	552	72	304	1444
61	387	2379	496	368	584	66	288	1126
SERIES - III								
61	409	2956	518	373	584	66	350	1103
62	434	3170	574	- 11	485	64	307	1133
63	553	1467	416	1210	192	78	301	1543

Source: Statement 5:1 C

We shall now present in a compact form various results obtained in the previous Chapters.

10:5 AVERAGE YEARLY EARNINGS (1950-'1964)

The following table brings out many interesting results:

Take one: Showing trend in average yearly earnings of employees of various industries during post-independence period (1950-'64)

TABLE EIGHT

ry	Regression (Parabolic)	Absolute yearly change (In Rs.(ooo')	Value	Remarks	
	2	3	4	5	
ent	$Y=4.204+0.29t +0.018t^2$	4.534	0.544	Not significant at 5 percent	
ton tile	$Y = 4.528+0.213t +0.006t^2$	4.60	0.435	-do-	-do-
llen tile	$Y = 4.11+ 0.11t +0.006t^2$	4.27	0.563	-do-	-do-
e tile	$Y = 3.51+0.109t + 0.004 t^2$	3.58	0.123	-do-	-do-
ar	$Y = 2.38 + 0.16 t + 0.015 t^2$	2.66	0.122	-do-	-do-
ches	$Y = 4.46 + 0.26 t + 0.021 t^2$	4.85	0.26	-do-	-do-
er & er Boards	$Y = 4.33 + 0.25 t + 0.031 t^2$	4.91	0.358	-do-	-do-
n & Steel	$Y = 5.44 + 0.2 t + 0.005 t^2$	5.5	0.413	-do-	-do-

rce: Compiled from 2:6, 3:6, 4:6, 5:6, 6:6, 7:6, 8:6, & 9:6.

From the above table following conclusions can be drawn:

(a) The average yearly trends for all the industries under study are parabolic (of second degree). The acceleration is positive for all the eight industries.

(b) The trend coefficient are also positive and the χ^2- test shows that the fit is good at 5 percent level of significance.

(c) As far as the magnitude of the absolute yearly change rate is concerned, Iron and Steel is on the top followed by Paper and Paper Boards; Sugar being the lowest.

Thus, during the post-independence period (1950-'64) all the industries under study show a rising trend in average yearly earnings.

10:6 RELATIONSHIP BETWEEN YEARLY WAGE BILLS AND PRODUCTIVITY DURING POST- INDEPENDENCE PERIOD 1 9 5 0 - 1 9 6 4 :

1 :6(1) REGRESSION OF WAGE BILLS ON PRODUCTIVITY (1950-'64)

Table Nine; Showing regression of Wage Bills on productivity in various industri s under study during post-independence period (1 9 5 0 - '64)

...ry	Regression	Trend Co-effi-cient	Absolute Yearly Change	't' - value	Remarks	
	2	3	4	5	6	
...ent	Linear	0.51	4.12	3.111	Significant at 5 percent	
...ton Tex-...e	-"-	0.108	12.5	3.479	-"-	-"-
...llen ...tile	-"-	• 0.39	2.9	3.3501	-"-	-"-
...e Textile	-"-	0.008	3.1	0.052	Insignificant at 5 percent	
...ar	-"-	-0.416			-"-	-"-
...ch	-"-	+ 0.43	2.18	2.962	-"-	-"-
...er & Paper ...rds	-"-	0.319			-"-	-"-
...n & Steel	-"-	0.571			-"-	-"-

Source: Compiled from Tables 2:7 to 9:7.

The above table points out that :

(a) The regression is linear for all the eight industries.

(b) The trend co-efficients are positive for all the industries, except Sugar.

(c) The t-value are significant at 5 percent for Cement, Cotton, Woollen, Mathh, Paper and Paper Board, Iron & Steel. It is insignificant for Jute & Sugar Industries.

(d) As far as the positive magnitude of the regression co-efficient between wages as dependent variable and productivity as independent variable is concerned it is highest for Iron & Steel Industry followed by Cement Industry. Lowest trend co-efficient is that of Jute Textile Industry, amount ~~the-e~~. being 0.[illegible]. Negative co-efficient is only of the Sugar Industry, amount being minus 0.416

10:6.2 [illegible]:(1950-'64)

From the table No.10 the following inferences can be easily drawn:

(a) The regression is linear for all the eight industries.

(b) The trend co-efficients are positive for all the industries.

(c) The t-values are significant at 5 percent in all the industries under study, except in Jute for which it is insignificant at five percent level.

(d) As far as the magnitude of the absolute yearly change rate is concerned, Sugar is on the top, magnitude being 34.4 followed by Cotton & Textile Industry, magnitude being 17.5; Match Box Industry having the lowest, amount being 3.9.

Thus during 1950-'64 productivity is significantly explained by wages of the employees.

It can thus safely be concluded that if labour is paid highly its productivity will be in the positive direction, resulting in higher production, which viz. National Income of a country.

.E TEN : Showing regression on Productivity of Wage Bills in various industries i under study during (1950-'64):

stry	Regression	Trend Co-efficient	Absolute Yearly change	t-Value	Remarks
	2	3	4	5	6
ement	Linear	1.905	12.17	4.0005	Significant at 5 percent
otton extile	-"-	1.31	17.50	3.404	-"-
oollen extile	-"-	2.19	5.9	3.285	-"-
ute extile	-"-	0.201	4.52	0.4041	Insignificant at 5 percent
ugar	-"-	10.21	34.34	2.64	Significant at 5 percent
atch	-"-	1.523	3.9	2.818	-"-
aper & aper Boards	-"-	4.33	9.95	3.8537	-"-
ron & teel	-"-	1.34	5.1	2.881	-"-

ource: Compiled from various regression tables, viz. Table No. 2:7, 3:7, 4:7, 5:7, 6:7, 7:7, 8:7 and 9:7.

10:7 CORRELATION BETWEEN WAGE SETTLEMENTS AND PRODUCTIVITY

TABLE ELEVEN:

Showing Karl Pearson's Correlation Co-efficient between wages of employees and productivity for various industries during Post-Independence period 1950-'64:

y	Correlation Calculated	Correlation Coefficient	t-Value	Remarks	
	2.	3.	4.	5	
nt	Simple	0.86	5.925	Significant at 5 percent	
on ile	-"-	0.95	10.80	-"-	-"-
len ile	-"-	0.97	14.20	-"-	-"-
ile	-"-	0.84	5.639	-"-	-"-
r	-"-	0.674	3.36	-"-	-"-
h	-"-	0.63	2.146	-"-	-"-
r & r Boards	-"-	0.97	12.12	-"-	-"-
& l	-"-	0.78	4.37	-"-	-"-

Source : Compiled from various Tables Viz. 2:5, 3:5, 4:5, 5:5 6:5, 7:5, 8:5 and 9:5.

From the above table following facts are drawn:

~~Thus, there is strong and positive~~

(a) the simple correlationco-efficients are positive.

(b) all the correlation co-efficients are significant at 5 percent.

Thus, there is strong and positive co-rrelation between wages and productivity during 1950-'64.

10:8 MULTIPLE REGRESSION OF TOTAL YEARLY EARNINGS' INDEX ON CONSUMER'S PRICE INDEX NUMBER AND PRODUCTIVITY (1951 - 1964)

Table 12(a) : Showing partial regression (Net Regression) of Total yearly earnings on Consumers' Price Index Number during 1951-'64 for various industries:

ry	Regression Used	Partial (Net) Regression ($b_{y1.2}$)	't'-value	Remarks	
	2	3	4	5	
ent	Partial	1.71	1.881	Significant at 5 percent	
tton tile	-do-	0.39	0.742	Insignificant at 5 percent	
llen tile	-do-	0.959	1.1508	-do-	-do-
e tile	-do-	0.91	2.548	Significant at 5 percent	
jar	-do-	0.58	0.754	Insignificant at 5 percent	
ches	-do-	1.23	2.0295	Significant at 5 percent	
per & per Boards	-do-	1.51	2.4311	-do-	-do-
n & el	-do-	1.32	3.1812	-do-	-do-

Source: Compiled from tables 2:8, 3:8, 4:8, 5:8, 6:8, 7:8, 8:8 and 9:8.

10:8 MULTIPLE REGRESSION OF TOTAL YEARLY EARNINGS INDEX ON CONSUMERS PRICE INDEX NUMBER AND PRODUCTIVITY
(1951-1964) (Contd.,)

Table 12(c): Showing multiple co-rrelation of between total yearly earnings and Consumers Price Index Number along with productivity index number for various industries 1951 - 1964:

try	Regression used	Multiple Correlation Coefficient	'F'-Value	Remarks	
	2	3	4	5	
nent	Partial	0.5874	4.058	significant at 5 percent	
tton xtile	-do-	0.917	20.22	-do-	-do-
ollen xtile	-do-	0.809	8.66	-do-	-do-
te xtile	-do-	0.50	10.50	-do-	-do-
gar	-do-	0.793	35.87	-do-	-do-
tches	-do-	0.804	30.29	-do-	-do-
per & per Boards	-do-	0.8409	14.6	-do-	-do-
on & eel	-do-	0.783	31.6	-do-	-do-

Source: Compiled from Tables 2:8, 3:8, 4:8, 5:8, 6:8, 7:8, 8:8, 9:8

10:8 MULTIPLE REGRESSION OF TOTAL YEARLY EARNINGS INDEX ON CONSUMERS PRICE INDEX NUMBER AND PRODUCTIVITY (1951-1964) (Contd.,)

Table 12(c): Showing multiple co-rrelation of between total yearly earnings and Consumers Price Index Number along with productivity index number for various industries 1951 - 1964:

ndustry	Regression used	Multiple Correlation Coefficient	'F'-Value	Remarks
	2	3	4	5
. Cement	Partial	0.5874	4.058	significant at 5 percen
. Cotton Textile	-do-	0.917	20.22	-do- -do-
. Woollen Textile	-do-	0.809	8.66	-do- -do-
. Jute Textile	-do-	0.50	10.50	-do- -do-
. Sugar	-do-	0.793	35.87	-do- -do-
. Matches	-do-	0.804	30.29	-do- -do-
. Paper & Paper Boards	-do-	0.8409	14.6	-do- -do-
. Iron & Steel	-do-	0.783	31.6	-do- -do-

Source: Compiled from Tables 2:8, 3:8, 4:8, 5:8, 6:8, 7:8, 8:8, 9:8

10:8 MULTIPLE REGRESSION OF TOTAL YEARLY EARNINGS' INDEX ON CONSUMERS PRICE INDEX NUMBER AND PRODUCTIVITY

(1951-1964) (Contd)

Table 12(b): Showing partial regression (Net Regression) of Total yearly earnings on Productivity Index Number during 1951-'64, for various industries under study:

Industry	Regression Used	Partial (Net) Regression ($b_{y2.1}$)	't' - value	Remarks	
	2	3	4	5	
. Cement	Partial	0.571	1.9988	Significant at 5 percent	
. Cotton Textile	-do-	1-01	3.2925	-do-	-do-
. Woollen Textile	-do-	-0.102	-0.204	Insignificant at 5 percent	
. Jute Textile	-do-	0.03	0.0975	-do-	-do-
. Sugar	-do-	0.77	2.426	Significant at 5 percent	
. Matches	-do-	0.47	1.4056	Insignificant at 5 percent	
. Paper & Paper Boards	-do-	0.21	0.6231	-do-	-do-
. Iron & Steel	-do-	-0.11	-0.44	-do-	-do-

Source: Compiled from Tables 2:8, 3:8, 4:8, 5:8, 6:8, 7:8, 8:8 and 9:8.

From the Table 12(a), 12(b), and 12(c), following conclusions can be drawn:

(a) the partial regression coefficient of total yearly earnings on Consumer's Price Index Number is positive for all the industries under study. The 't-values or significant at ~~Sice~~ five percent for Cement, Jute Textile, Matches, Paper and Paper Boards and Iron and SteelIndustries. It is insignificant at 5 percent level for the rest of the industries, viz. Cotton Textile, Woollen Textile and Sugar Industries. (Vide Table 12(a))

(b) The partial regression coefficient of total yearly earnings on productivity index Number ($b_{y2.1}$) is positive for all the industries except Woollen Textile and Iron and Steel Industries. The values of 't' is significant for all the industries except Jute, Woollen Textile, Matches, Paper and Paper Boards and Iron and Steel. It is significant for Cement, Cotton Textile and Sugar Industries. (Vide Table 12(b))

(c) There is strong and positive multiple correlation in all the Eight Industries under study. The F-Value is significant at 5 percent in all the industries. (Vide Table 12(c))

Thus, total yearly earnings are explained upto a greater extent by Consumer's Price Index Number and Productivity Index Number

10:9 SIZE OF ESTABLISHMENT, WAGES AND PRODUCTIVITY: (1958)

TABLE 13: Showing regression of value added on Productivity according to size of establishment(1958):

Industry	Regression used	Trend Coefficient	Absolute Yearly Change	t-value	Remarks
1	2	3	4	5	6
Cement	Linear Logarathmic	2.02	6.5	1.818	Significant at 5 percent
Cotton Textile	-do-	1.817	6.3	2.1756	-do- -do-
Woollen Textile	-do-	1.771	6.3	1.0626	~~-do-~~ Insignific at 5 percent
Jute Textile	-do-	2.262		1.3798	-do- -do-
Sugar	-do-	2.26	5.11	2.1489	Significant at 5 percent
Matches	-do-	1.588	4.68	1.572	Insignificant at 5 percent
Paper & Paper Boards	-do-	1.686	5.60	2.529	Signisificant at 5 percent
Iron & Steel	-do-	2.165	5.6	0.866	Insignificant at 5 percent

Source: Compiled from Tables 2:9, 3:9, 4:9, 5:9, 6:9, 7:9, 8:9 and 9:9.

TABLE 13, points out that :

(a) the trend-coefficients are positive for all the industries under study.

(b) the regression is linear logarithamic for all the industries.

(c) The 't' values of Cement, Cotton Textile , Sugar and Paper and Paper Boards Industries are significant and insignificant for Woollen Textile, Jute Textile, Matches and Iron and Steel Industries at 5 percent.

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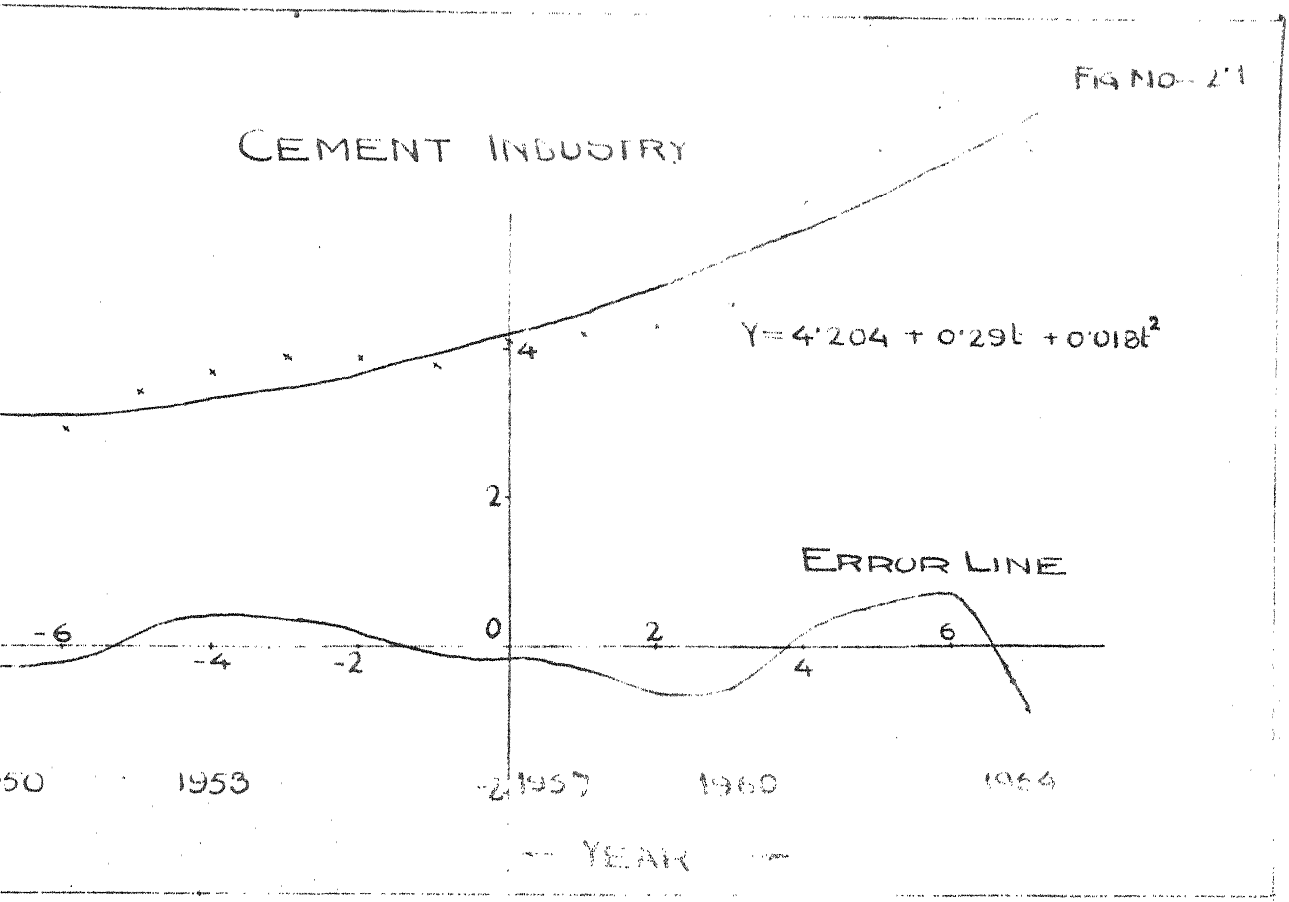
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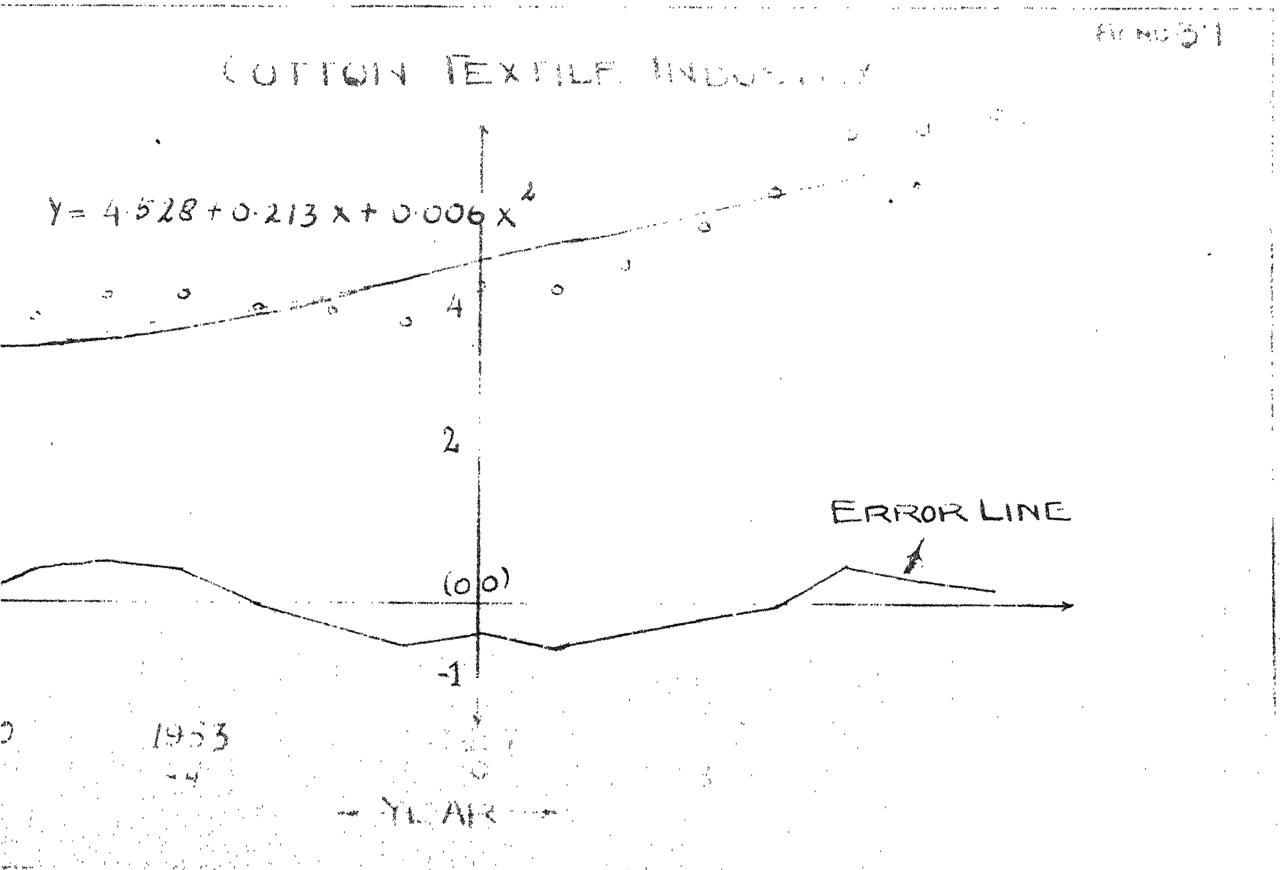
ERROR LINE
1953
1957
1960
1964
YEAR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ERROR LINE
(0,0)
1953
YEAR

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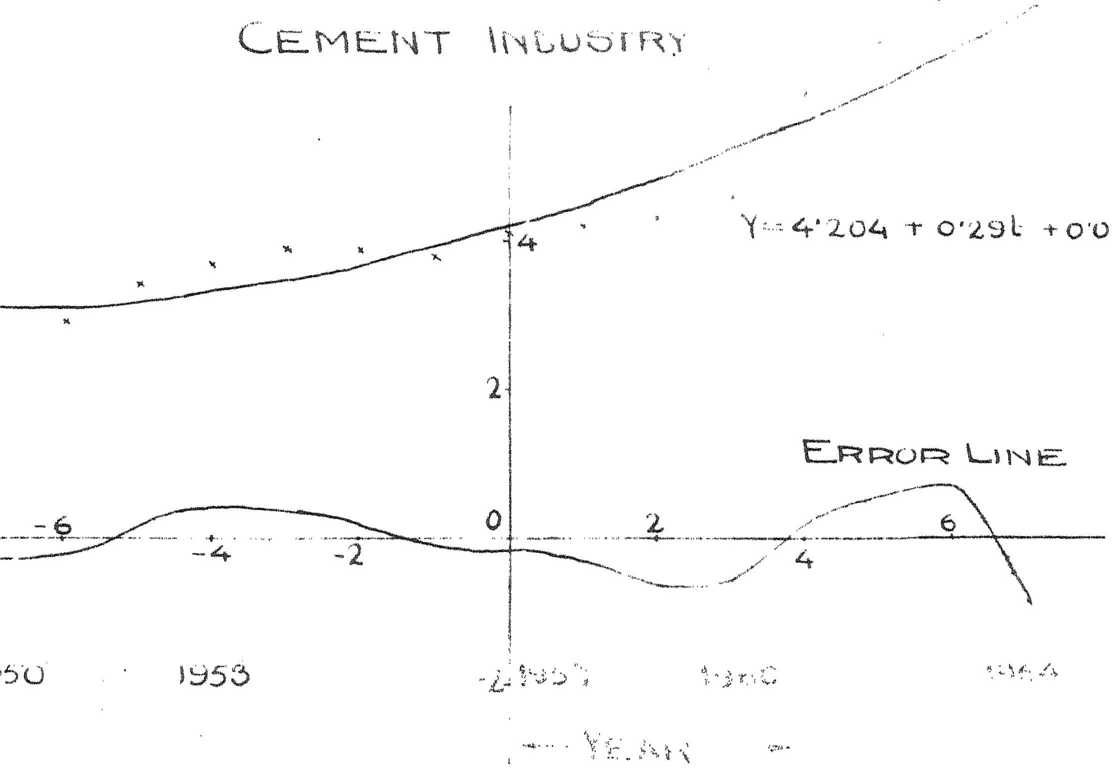

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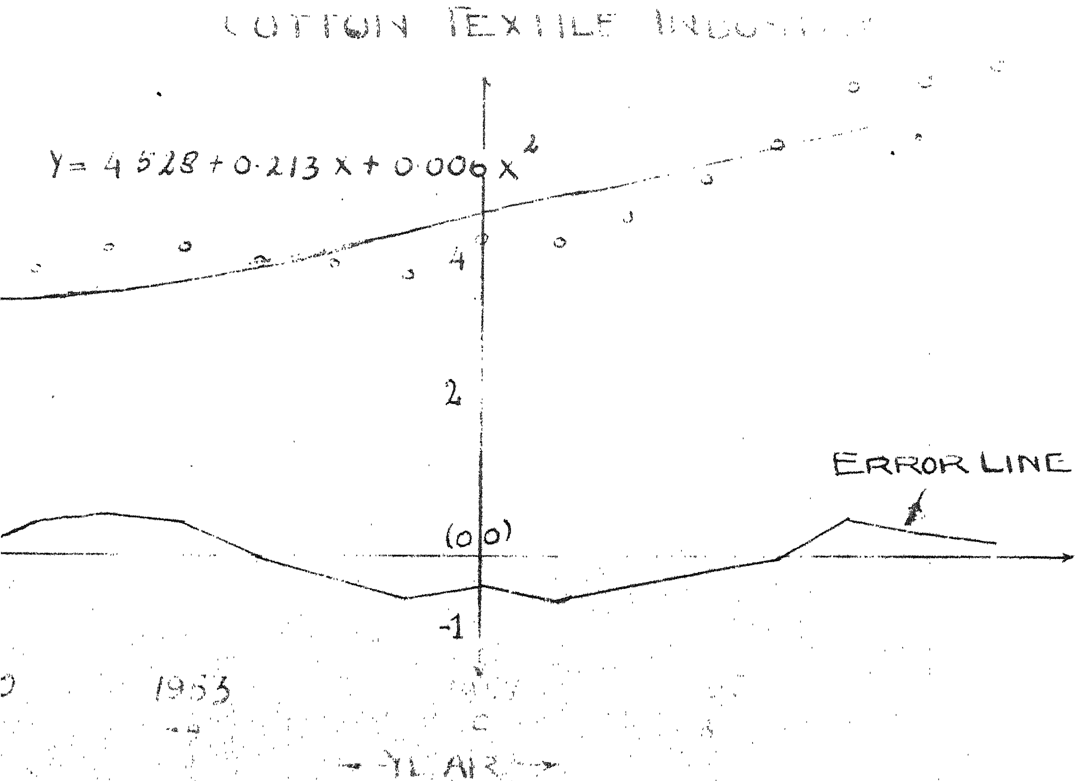

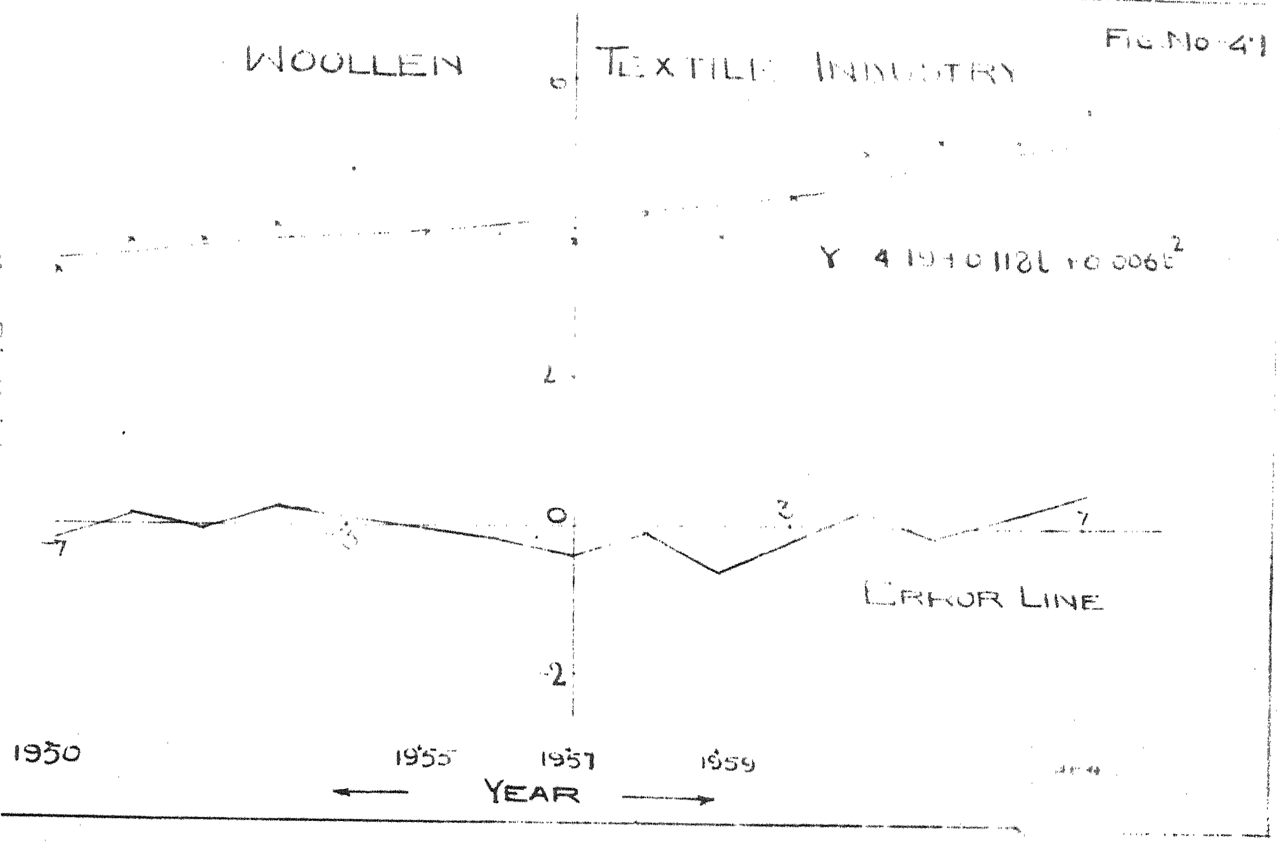
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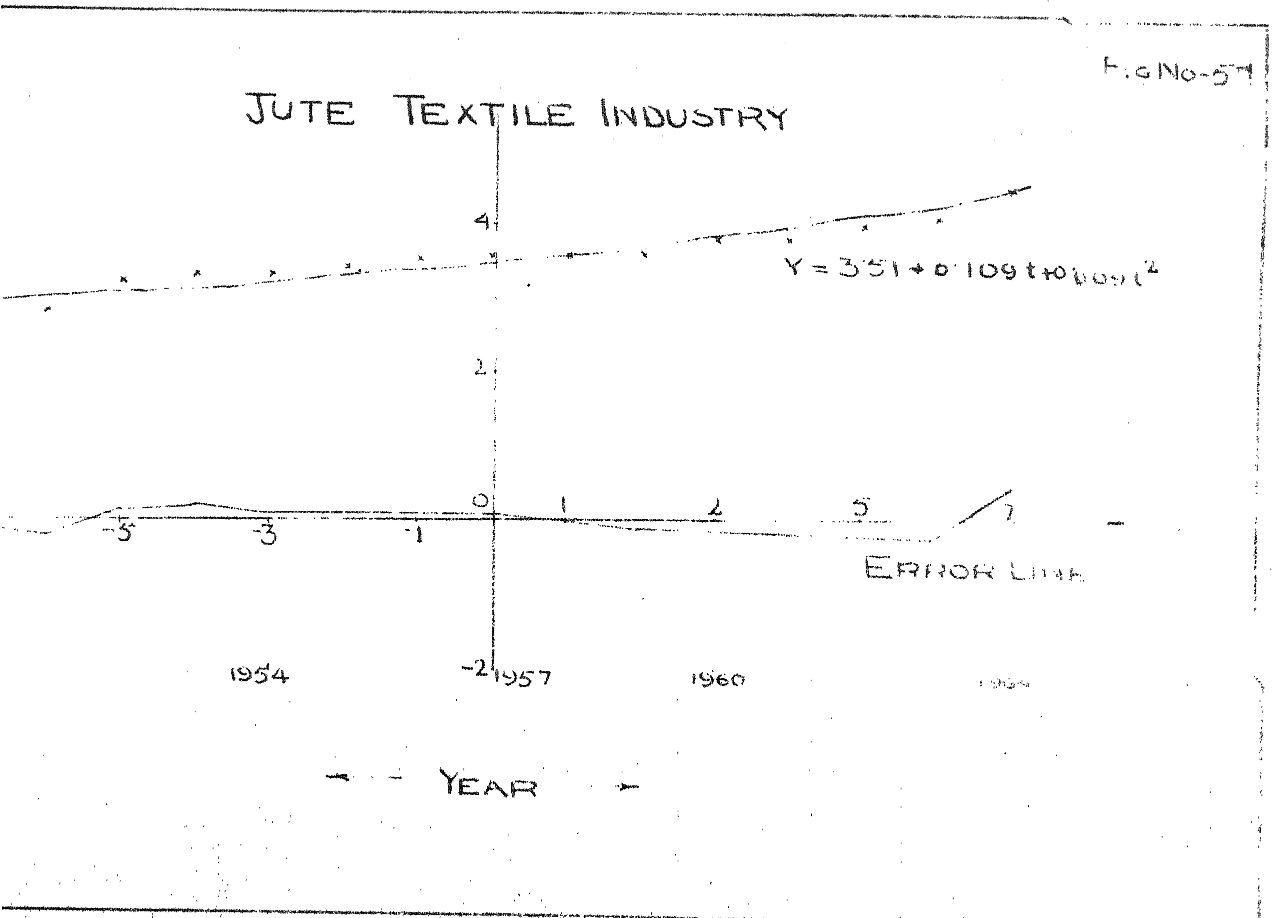
WOOLLEN TEXTILE INDUSTRY
ERROR LINE
YEAR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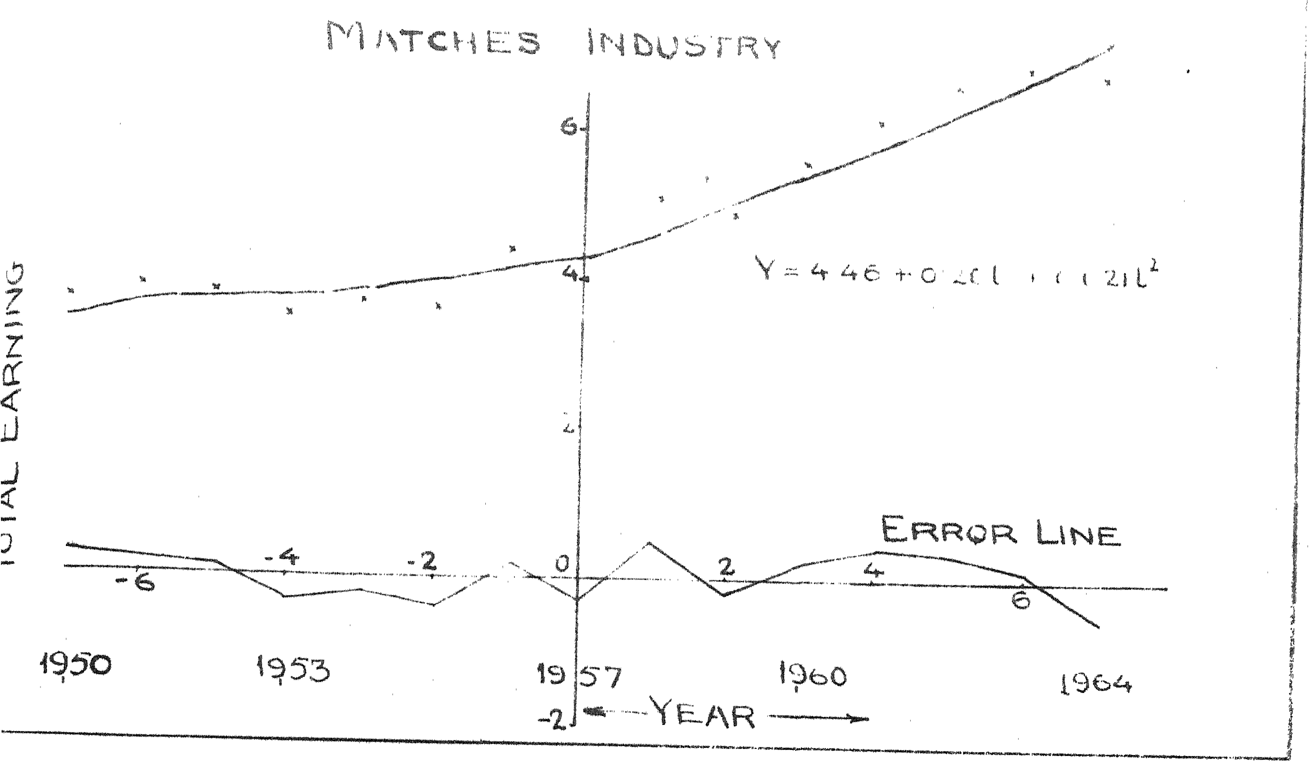
JUTE TEXTILE INDUSTRY
ERROR LINE
1954
1957
1960
YEAR


MATCHES INDUSTRY
TOTAL EARNING
6
4
2
-2
Y = 4·46 + 0·20t
ERROR LINE
-6
-4
-2
0
2
4
6
1950
1953
1957
1960
1964
YEAR

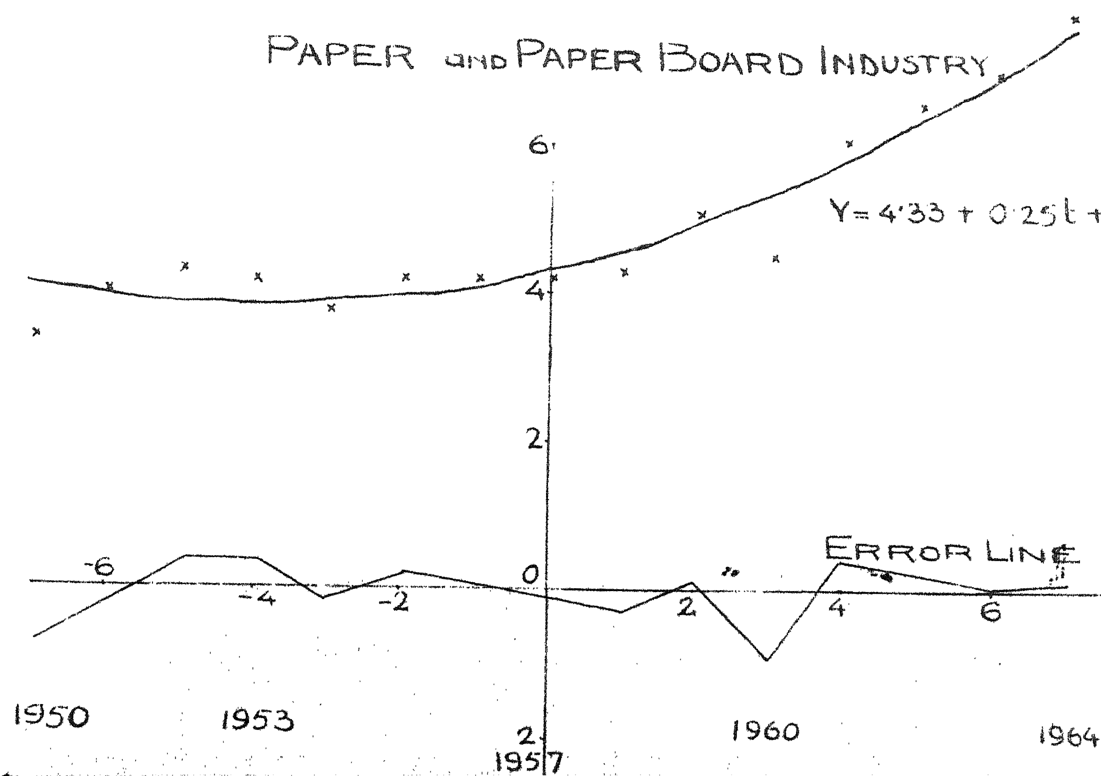
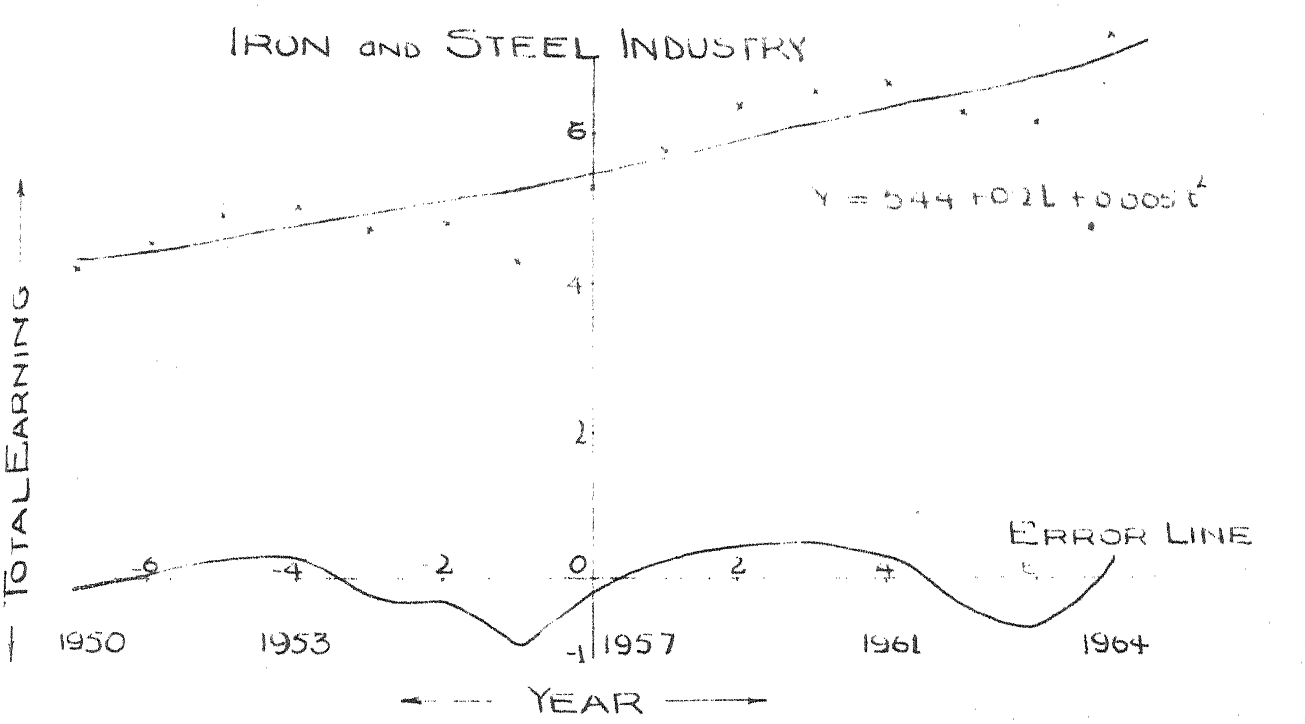

PAPER and PAPER BOARD INDUSTRY
6
4
2
2
Y = 4·33 + 0·25t + 0·013t²
ERROR LINE
-6
-4
-2
0
2
4
6
1950
1953
1957
1960
1964

FIG No-81

Fig No-9'1



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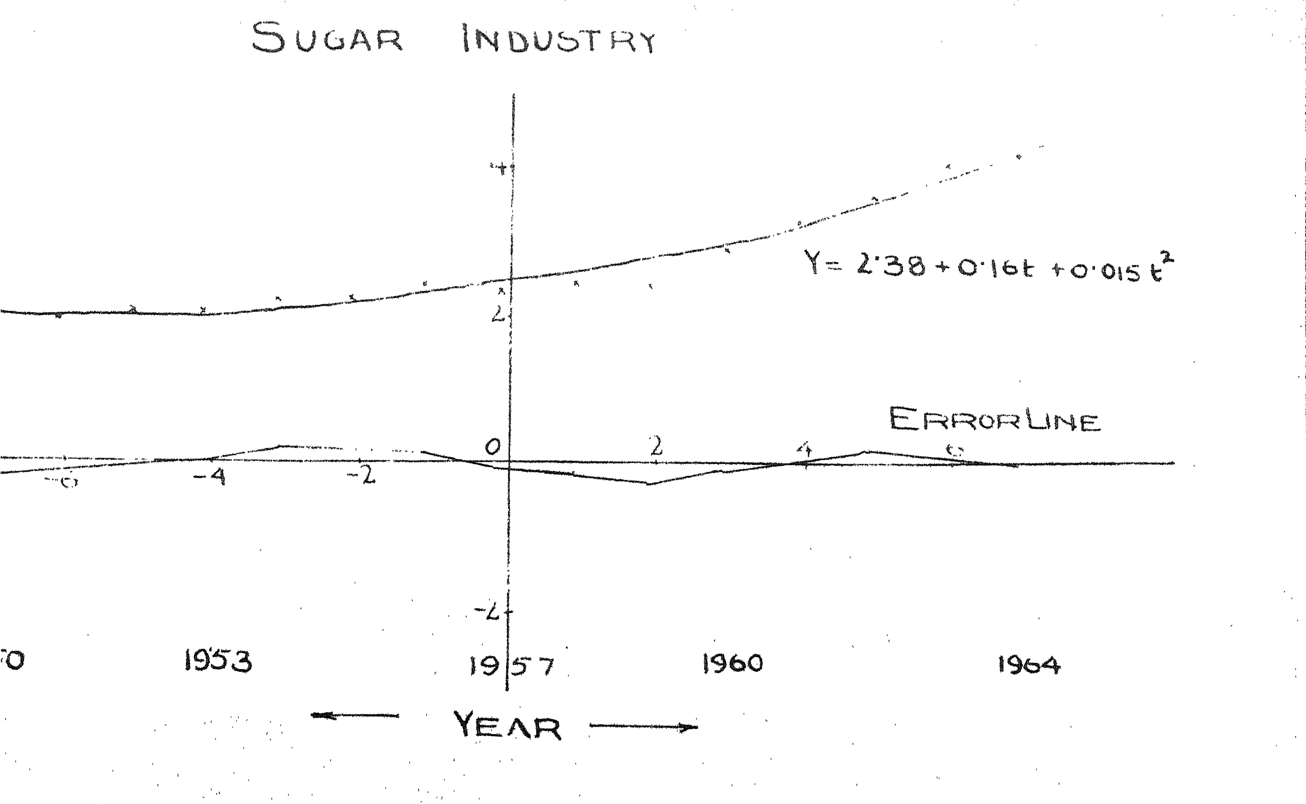
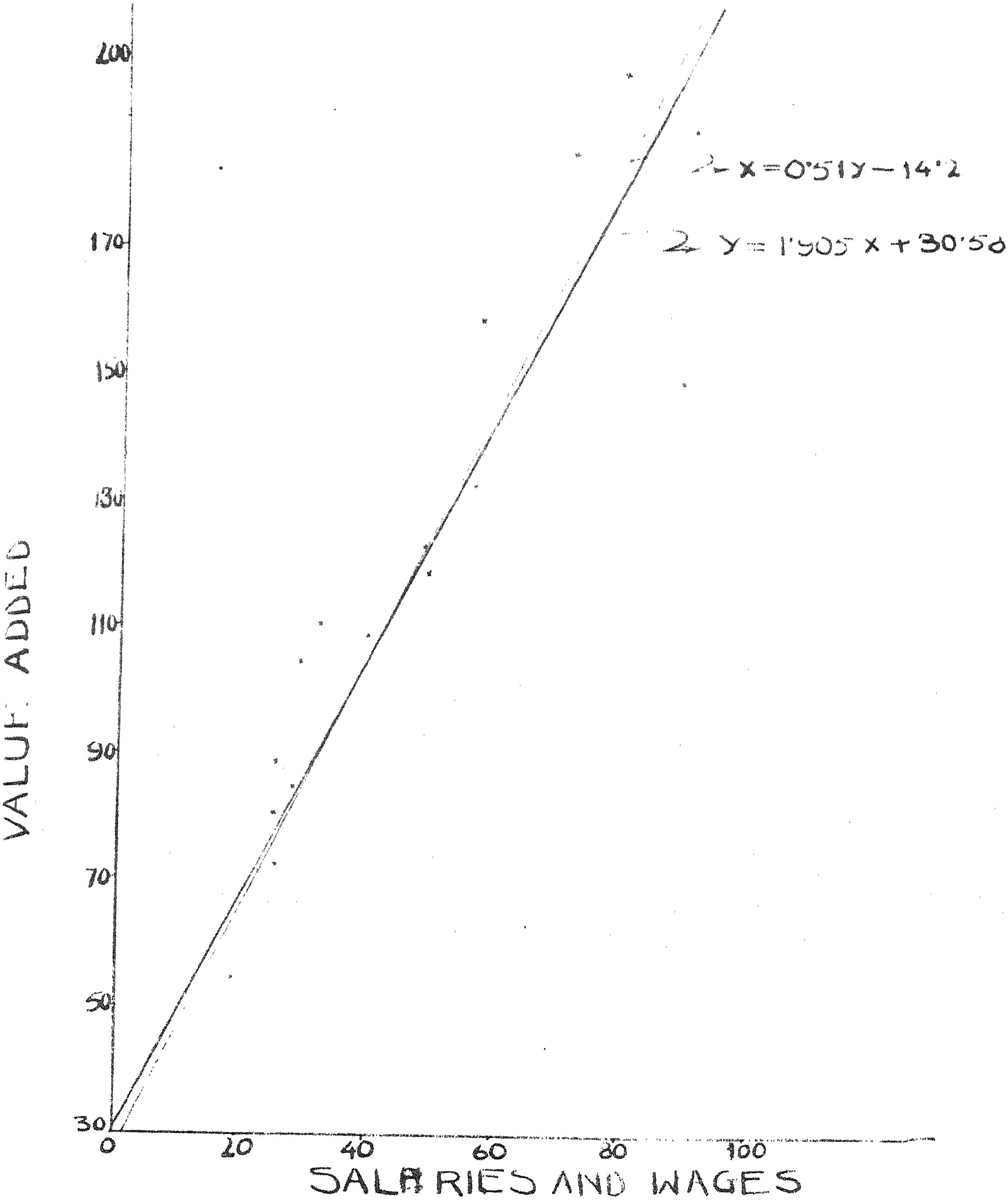


CEMENT INDUSTRY

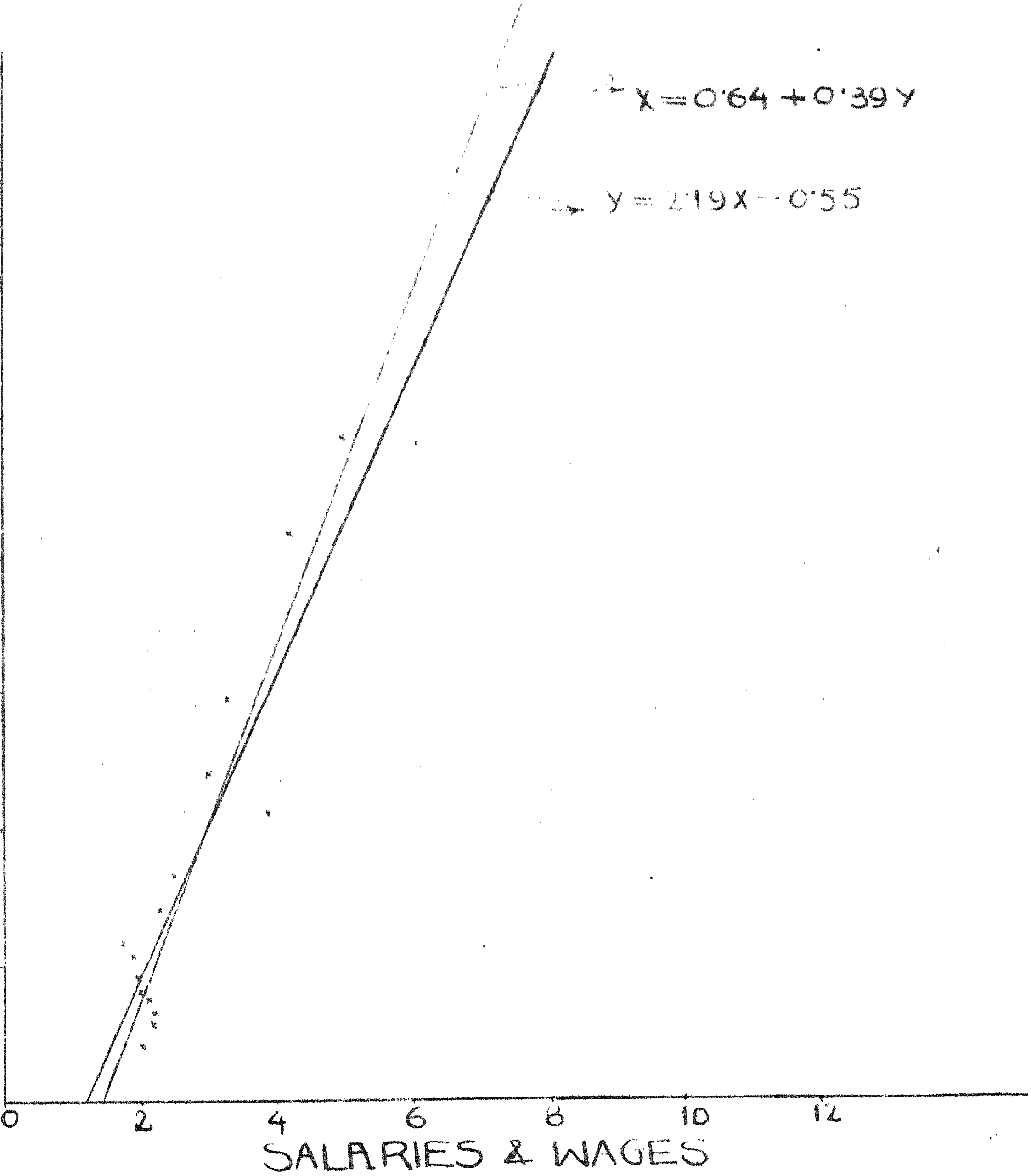


REGRESSION LINE BETWEEN - VALUE ADDED & SALARIES AND WAGES.

VALUE ADDED AND SALARIES AND WAGES.

FIG. NO-42

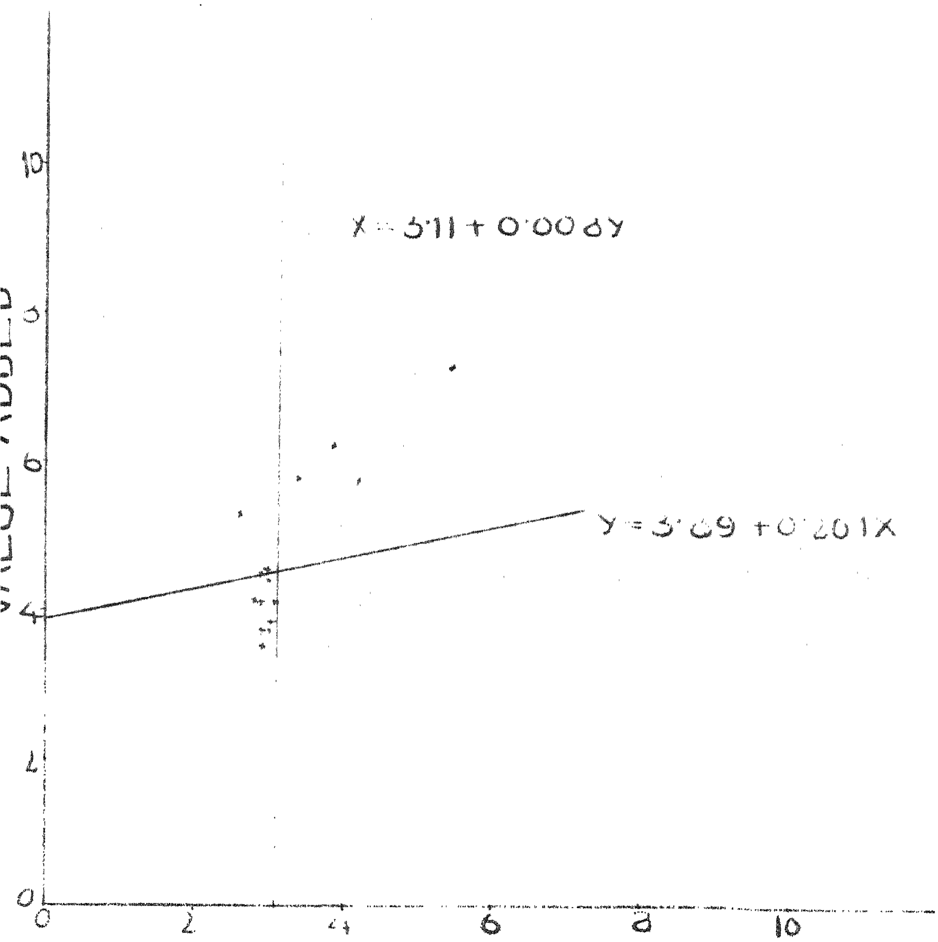
WOOLLEN TEXTILE INDUSTRY



REGRESSION LINE BETWEEN
VALUE ADDED AND SALARIES AND WAGES.

FIG NO 52

JUTE TEXTILE INDUSTRY



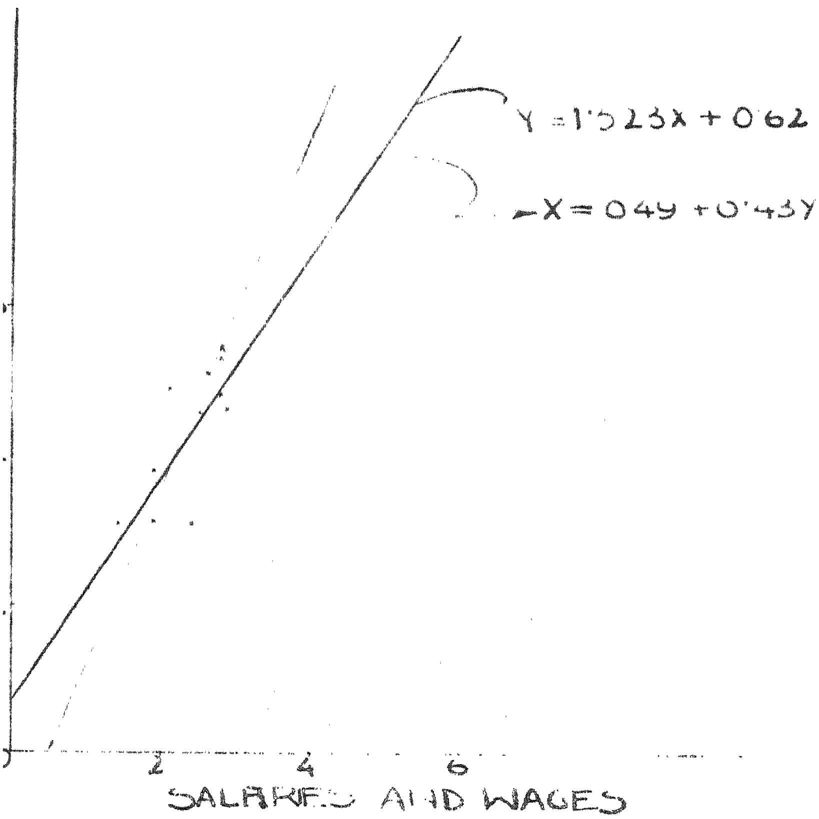
REGRESSION LINE BETWEEN -

VALUE ADDED AND SALARIES &

WAGES.

MATCHES INDUSTRY

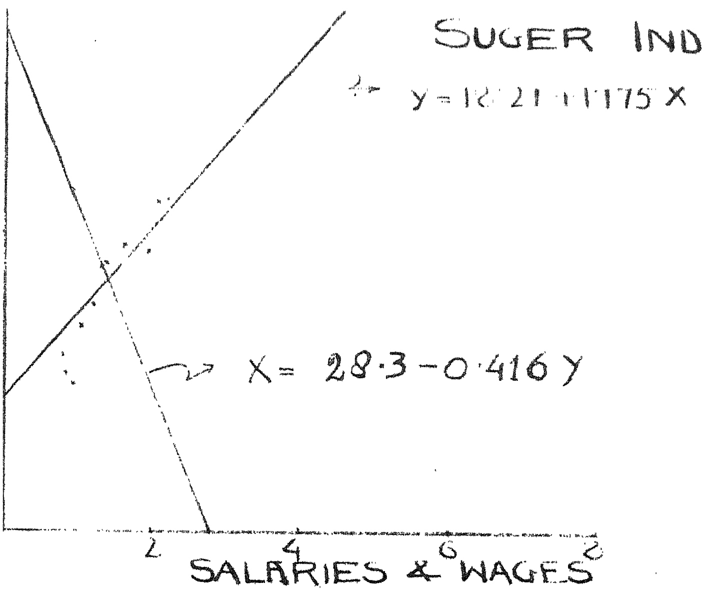
FIG NO 7.2



REGRESSION LINE BETWEEN
VALUE ADDED & SALARIES AND WAGES

FIG NO 6.2

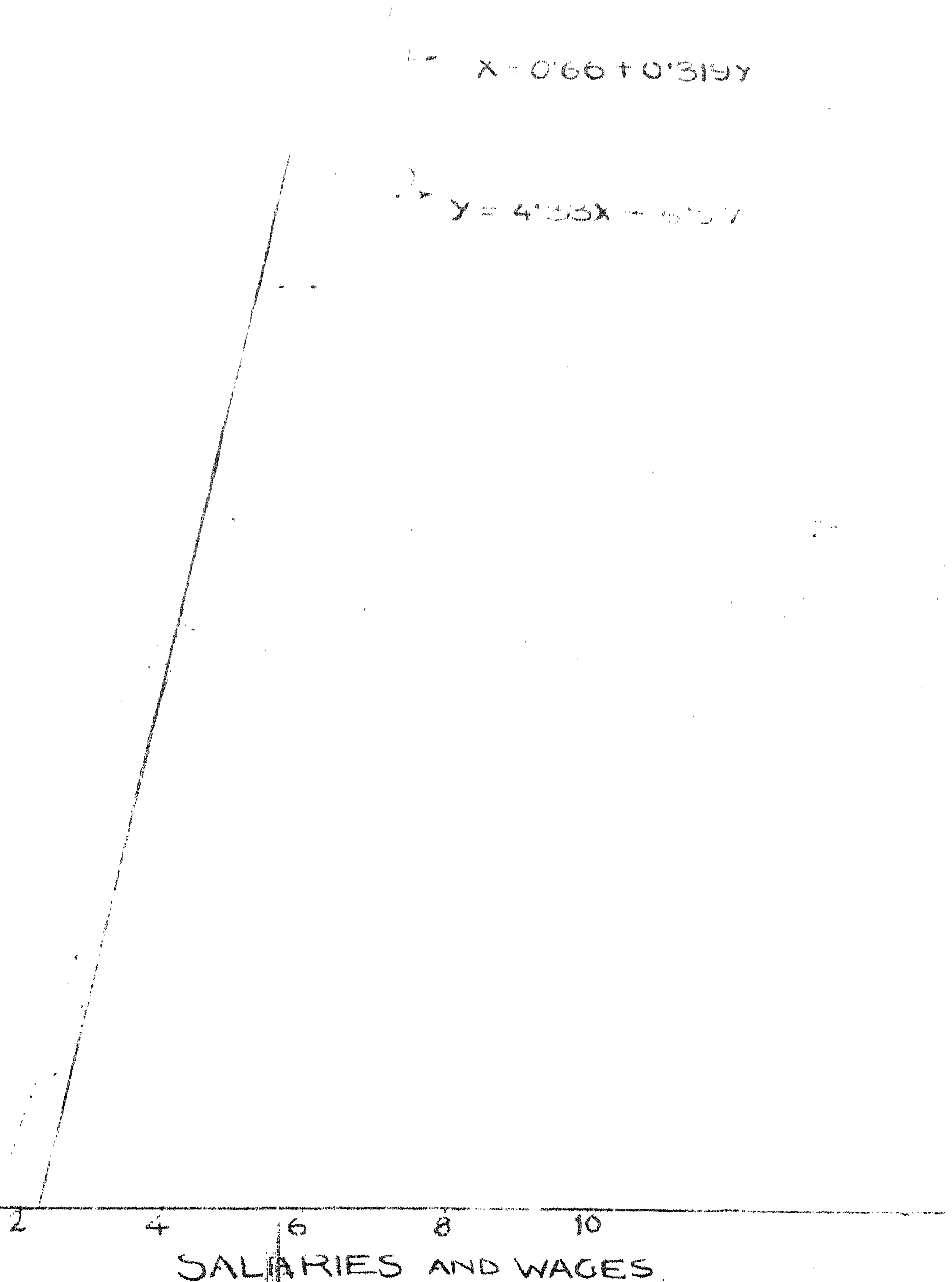
SUGER INDUSTRY



REGRESSION LINE BETWEEN
VALUE ADDED & SALARIES AND WAGES

CTG NO. 8.2

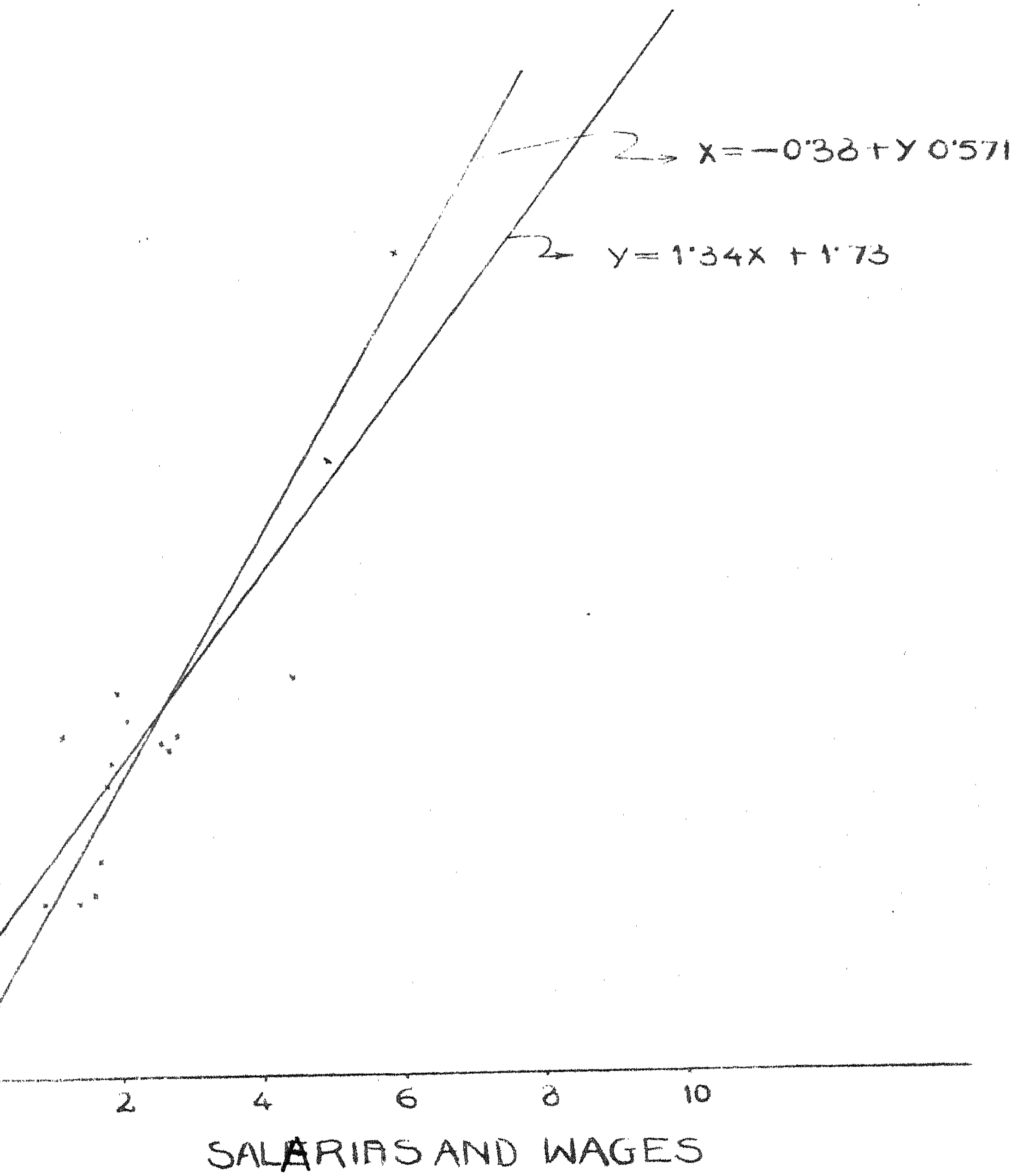
PAPER AND PAPER BOARD INDUSTRY



REGRESSION LINE BETWEEN
VALUE ADDED & SALARIES and WAGES

FIG NO- 9.2

IRON AND STEEL INDUSTRY



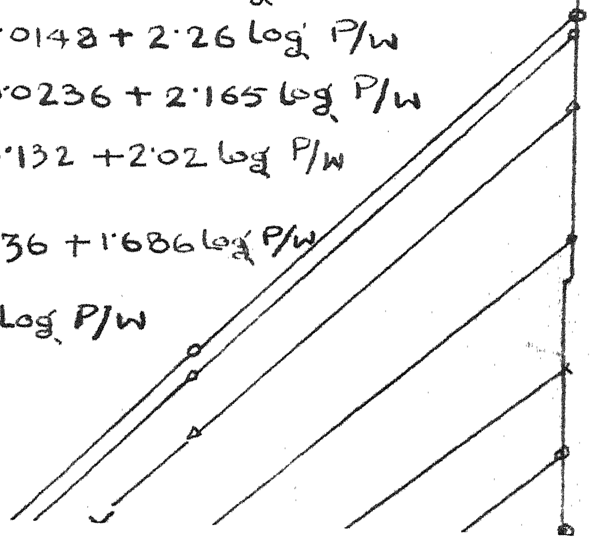
REGRESSION LINE BETWEEN
VALUE ADDED AND WAGES
AND SALARIES

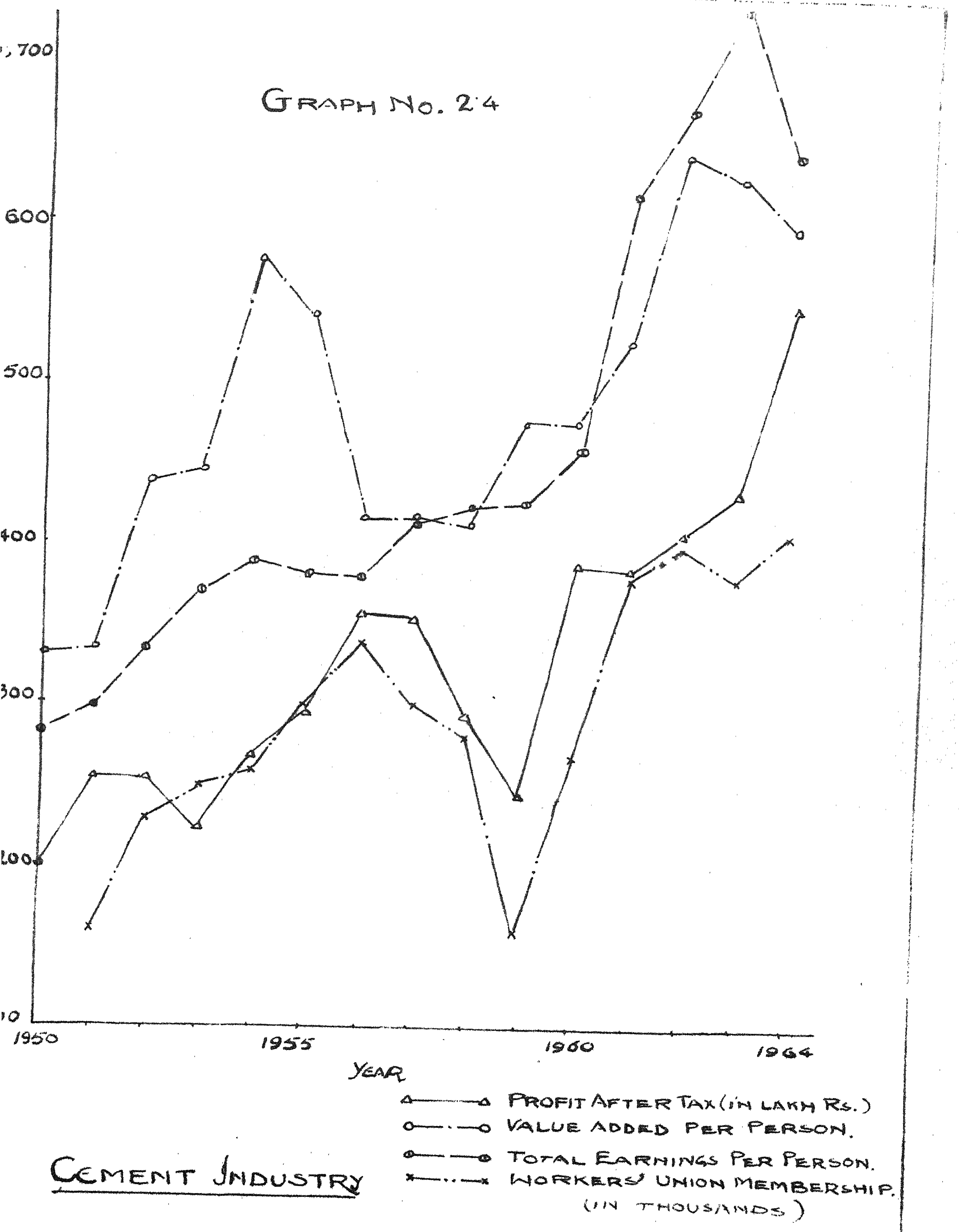
GRAPH NO. 2-93

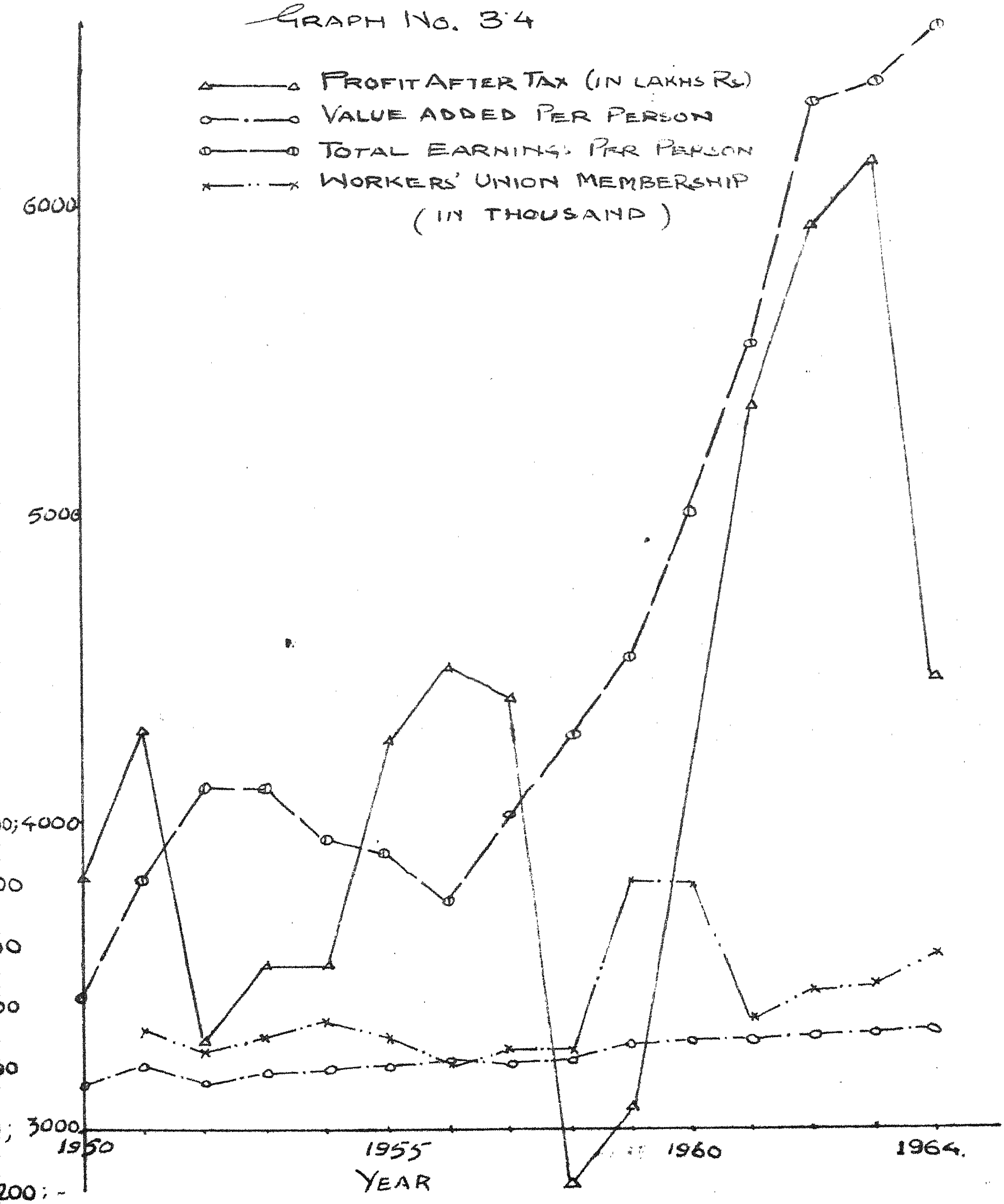
REGRESSION BETWEEN LOGARITHMS of PRODUCTION AND LABOUR PRODUCTIVITY.

REGRESSION EQUATIONS:-

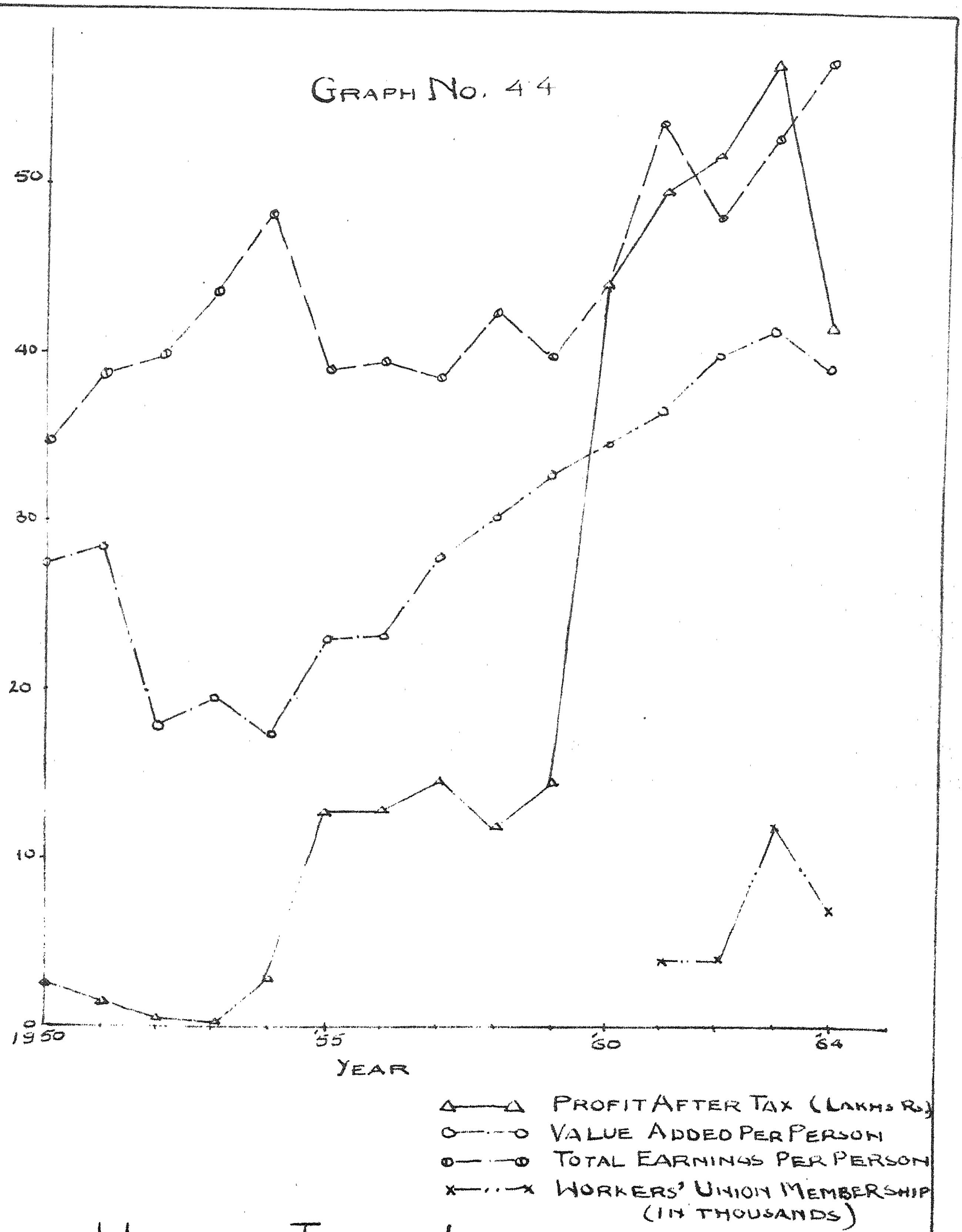
1. COTTON TEXTILES : $\log P = 0{\cdot}0243 + 1{\cdot}817 \log P/W$
2. WOOLLEN TEXTILES : $\log P = 0{\cdot}19 + 1{\cdot}771 \log P/W$
3. JUTE TEXTILES : $\log P = 0{\cdot}152 + 2{\cdot}262 \log P/W$
4. SUGAR INDUSTRIES: $\log P = -0{\cdot}0148 + 2{\cdot}26 \log P/W$
5. IRON & STEEL IND. : $\log P = -0{\cdot}0236 + 2{\cdot}165 \log P/W$
6. CEMENT INDUSTRIES: $\log P = -0{\cdot}132 + 2{\cdot}02 \log P/W$
7. PAPER & PAPER BOARDS : $\log P = 0{\cdot}136 + 1{\cdot}686 \log P/W$
8. MATCHES : $\log P = 0{\cdot}159 + 1{\cdot}588 \log P/W$



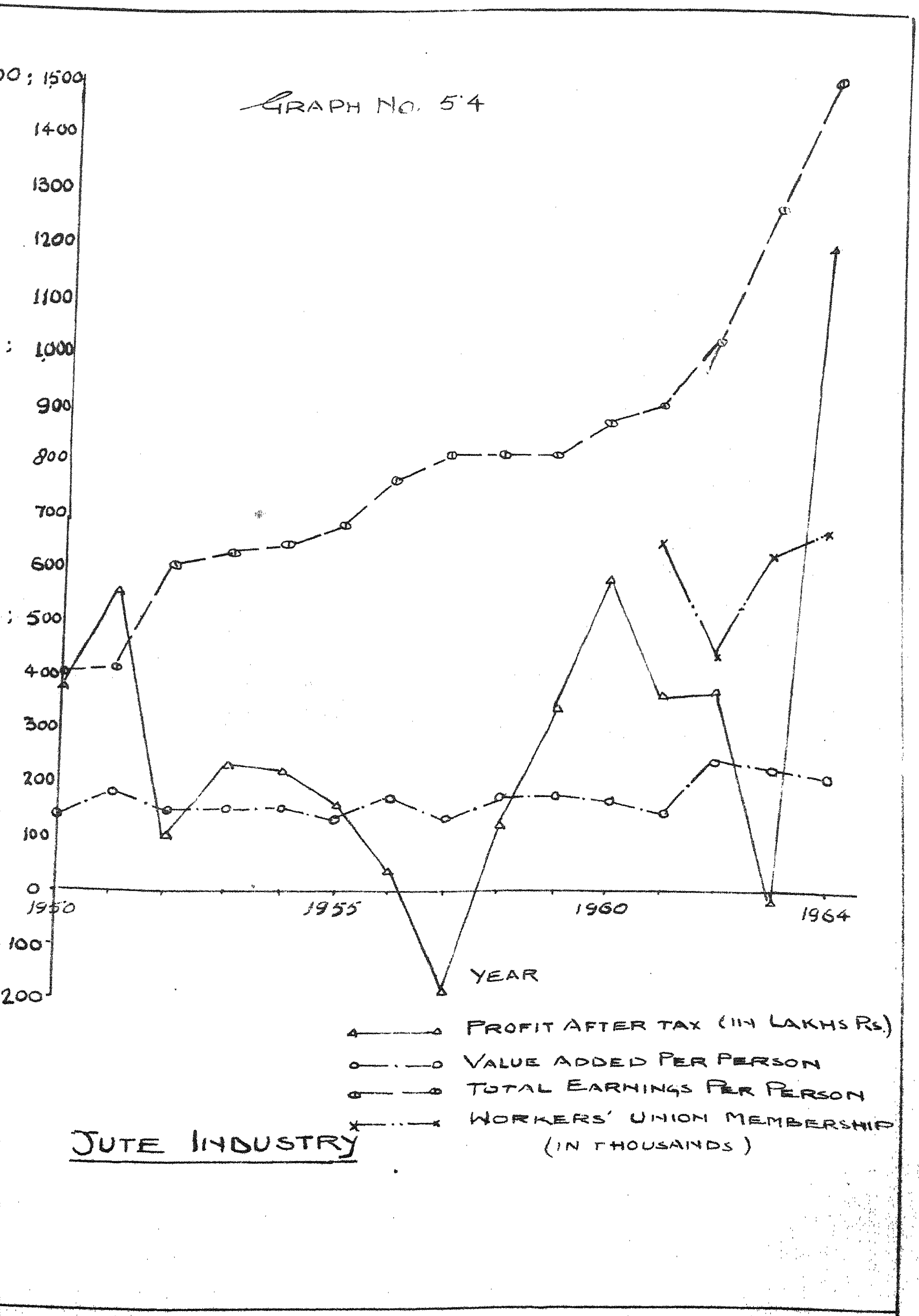

GRAPH No. 24
700
600
500
400
300
200
0
1950
1955
1960
1964
YEAR
PROFIT AFTER TAX (IN LAKH Rs.)
VALUE ADDED PER PERSON.
TOTAL EARNINGS PER PERSON.
WORKERS' UNION MEMBERSHIP.
(IN THOUSANDS)
CEMENT INDUSTRY

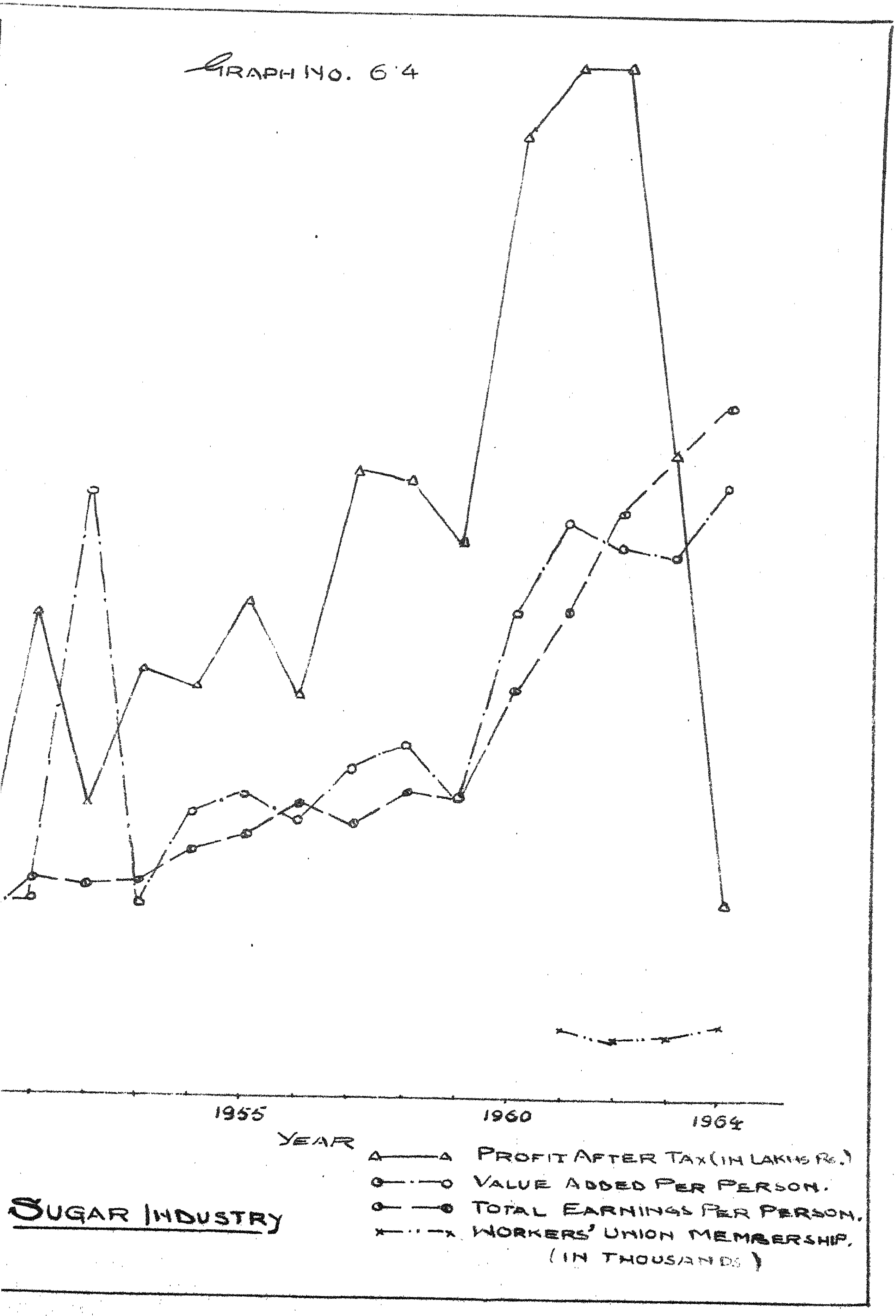


COTTON TEXTILE INDUSTRY

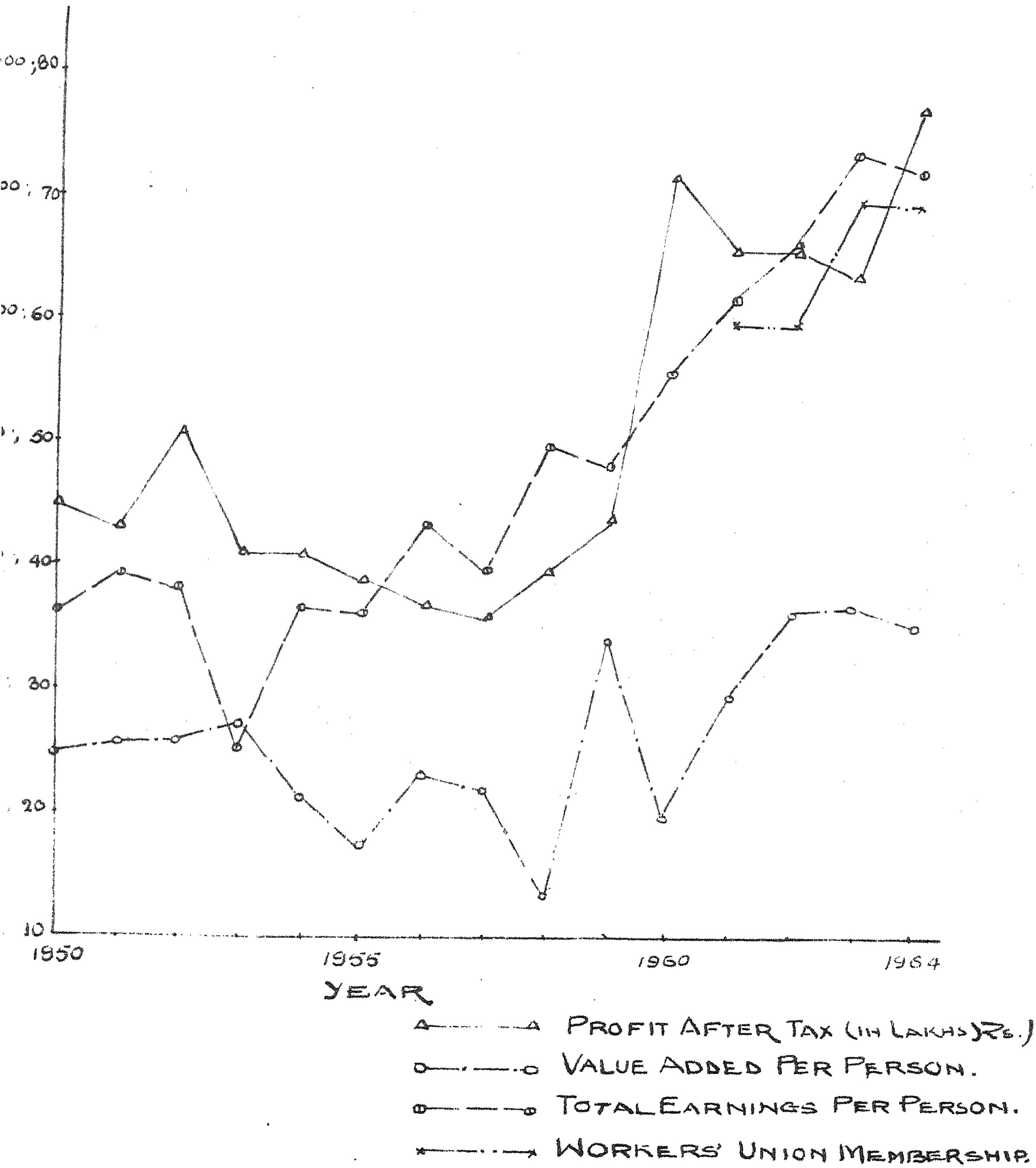


WOOLLEN TEXTILES INDUSTRY.

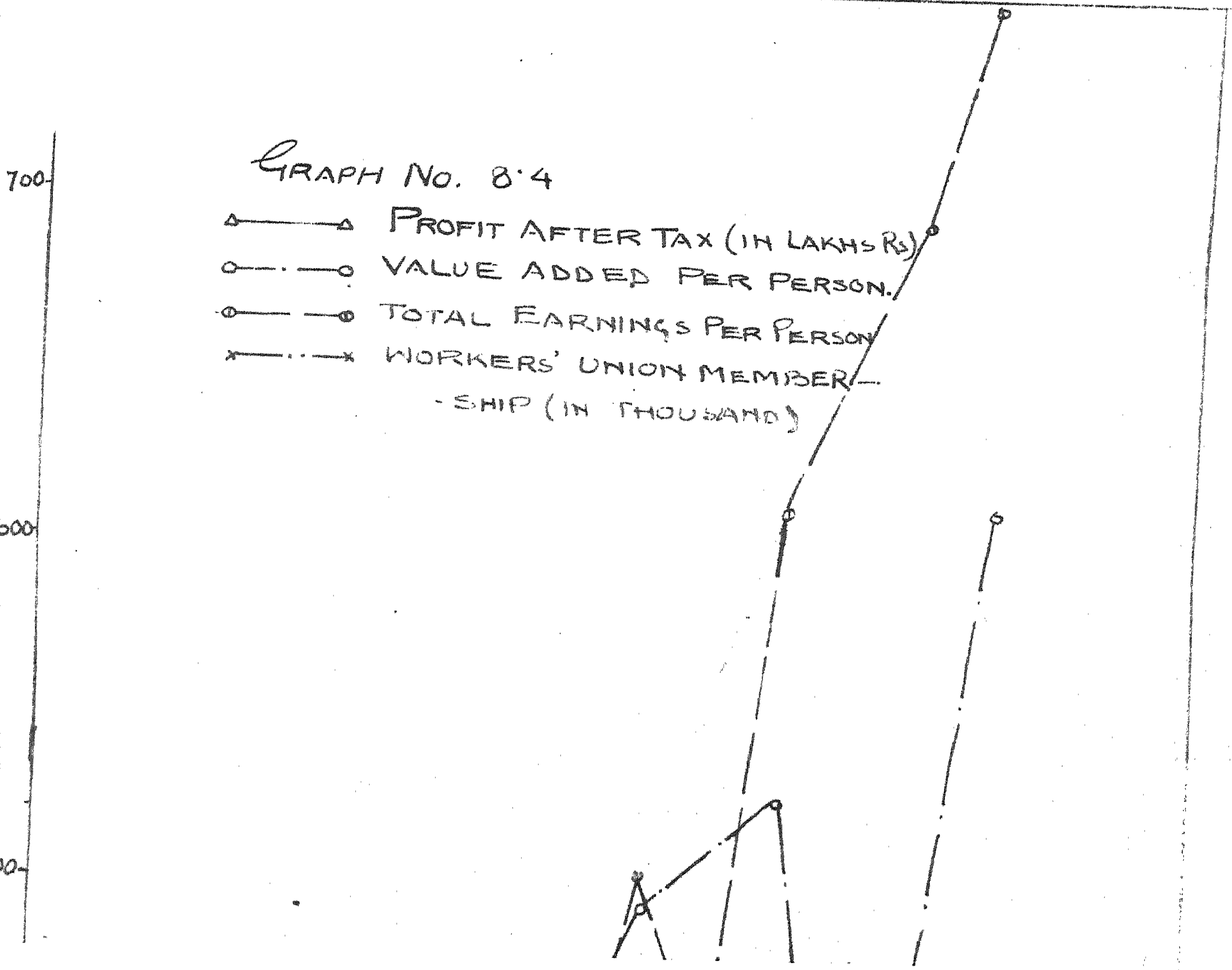

GRAPH No. 5.4
1500
1400
1300
1200
1100
1000
900
800
700
600
500
400
300
200
100
0
100
200
1950
1955
1960
1964
YEAR
PROFIT AFTER TAX (IN LAKHS Rs.)
VALUE ADDED PER PERSON
TOTAL EARNINGS PER PERSON
WORKERS' UNION MEMBERSHIP
(IN THOUSANDS)
JUTE INDUSTRY


GRAPH NO. 6·4
1955
1960
1964
YEAR
PROFIT AFTER TAX (IN LAKHS Rs.)
VALUE ADDED PER PERSON.
TOTAL EARNINGS PER PERSON.
WORKERS' UNION MEMBERSHIP. (IN THOUSANDS)
SUGAR INDUSTRY

Graph No. 7·4



MATCHES INDUSTRY.


GRAPH No. 8·4
PROFIT AFTER TAX (IN LAKHS Rs)
VALUE ADDED PER PERSON.
TOTAL EARNINGS PER PERSON
WORKERS' UNION MEMBER-
-SHIP (IN THOUSAND)
700

APPENDIX

(EXPLANATORY AND TABLES)

APPENDIX A — LIMITATIONS (5.1:11 - 5.7:11)

PROFITS AND PROFITABILITY OF PUBLIC LIMITED AND PRIVATE LIMITED COMPANIES : (Section - 5)

1. The statements in this section deal with profits and profitability of the public limited and private limited companies. Five measures of profitability are presented in the statements. These are : (i) Gross profits as percentage of Sales which measures the profit margin on sales, (ii) Gross profits as percentage of total capital employed (i.e. total net assets) which is an indicator of the gross return on total capital employed in the business, (iii) Profits after tax as percentage of net worth (i.e. paid up share capital + reserves and surplus) which measures the return on share holder's equity or the owned funds, (iv) Dividends as percentage of total paid up capital which indicates the rate of return on the original investment and (v) Dividends as percentage of net worths which is a measures of the profit distributed in relation to share holders equity.

2. The relation also brings together the index number of industrial profits for the period 1951 to 1963, published from time to time in the Reserve Bank of India Bulletine. The index numbers pertaining to public limited companies are in two series -(i) is based with 1950 - '51 as base covers the period 1950-'51 to 1955-'56 and (ii) is based on 1955-'56 covers the period 1956-'57 to 1962-'63. Index Numbers are calculated in respect of gross profit including depriciation and profits before tax . Besides, Index numbers of profitability based on the ratio of gross profit (including the depreciation) to total capital employed are also worked out.

3. For the first series covering 1951-'52 to 1955-'56 the the Index Numbers are employed using the fixed base method.

For individual industries, the index numbers are obtained by dividing the profits/profitability ratio of the same set of selected companies for each of the years by the corresponding figures relating to the base period. For the period 1956-'57 to 1959-'60 also, the fixed base method is adopted with base 1955-'56 = 100. In the case for the period 1960-'61 to 1962-'63 are, however, compiled employing the chain base method, as the companied covered in the studies pertaining to the period 1960-'61 to 1962-'63 are not all identical with those included in the studies for the earlier period. Thus for obtaining the 1960-'61 indices for individual industries (with base 1955-'56 = 100), the profit relatives for 1960-'61 are first worked out with 1959-'60 as base and these are linked to the corresponding indices for 1959-'60.

4. For compiling the indices for main groups and "all industries", the industry-wise data are combined using the ratios of the paid-up capital of all the companies to the paid up capital of the selected companies in the respective industries in the base period as weight. Index Numbers are then worked out from the aggragates for main groups and "the all industries" obtained in this manner, following the same method as in the case of individual industries.

5. The statement 5.1 presents the data on profits before tax and their allocation towards taxation provision dividends and retained profits of the medium and large public limited companies for the period 1950-'51 to 1962-'63. The data are presented separately each of 21 selected industries. The corresponding profits allocation ratios are brought together in Statement 5.2, 5.3, 5.4, 5.5, 5.6 and 5.7 present the profibility ratios of the medium and alrge public limited companies belonging to each of 21 Selected industries for the period 1950-'51 — 1962-'63. The distribution of the medium and large public limited companies of series III in each of the selected industries according to (i) the percentage of gross profits to total capital employed and (ii) the percentage of profits after tax to net worth

for the year 1962-'63 is presented in statements 5.8 and 5.9. The profit allocation ratio of these companies classified by size of paid up capital, for the year 1962-'63 are presented in statement 5.10 while profitability ratios by size of paid - up capital are given in Statement 5.11.

SOURCE:

Financial Statistics of Joint Stock Companies in India 1950-'51 to 1962-'63. p.13 — Reserve Bank of India Publication.

APPENDIX - 'B'

LIMITATIONS OF THE DATA OF CENSUS OF MANUFACTURERS AND ANNUAL SURVEY OF INDUSTRIES -

Census of Manufacturers of Industries - 1956:

1) This census of manufacturers was conducted under the Industrial statistics Act 1942. The Act and the Model of the Census of manufacturing Industries Rules issued thereunder by the various state Governments are reproduced in Appendix 'A' and Appendix 'B' respectively.

2) **Period Covered by the Census:**

Each census relates to a calender year, except in the case of the Sugar Industry for which the year ending 30th June is adopted.

3) **Note on terms used in the table:**

i) Registered factories -- For the purpose of the census only factories registered under the Indian Factory Act, 1948, which employ 20 or more workers on any day and use power are taken into account. Factories in existence during the year which did not work are also included.

ii) "**Average number of days worked**" This is computed by adding the number of days worked by the factories in the state or industry as the case may be and dividing the aggregate by the number of factories where manufacturing operations were carried on.

iii) **Productive Capital**

Capital employed on the relevent date (See below) in the factory itself and in running it is covered by this term. It consists of fixed capital (Comprising factory land, building,plants, machinery and miscellaneous assets such as furniture fittings, railway, sidings automobiles, patents and trade marks etc.,) and working capital (comprising stocks of raw materials, finished and semi-finished products, cash in hand and at the bank excluding credit deposits and current

credits) The value of capital items is taken as in books of the factory. The estimates under the various heads of capital relate to 31st December 1956, in the case of factories which closed their accounts on that date, and in other cases to the date on which accounts were last closed prior to 31st Decr.,

iv) Number of persons employed;

The average number of persons employed by each factory, under various heads such as workers, persons other than workers etc., on days on which manufacturing operations were carried on in the factory, is computed by adding the number of persons employed on all these days and dividing by the number of days. These averages are aggregate for all factories in the state or industry as the case may be and the aggregate is taken as this number of personsemployed in the state of Industry respectively.

iv) Workers:

The term workers is used in the same sense as in the Factories Act 1948, but excludes persons holding positions of supervision or management or employed in confidential position section 2(1) of the Factories Act, 1948 defines 'workers' as a person employed, directly or through any agency, whether for wages or not, in any manufacturing process or including any part of the machinery or premises used for a manufacturing process, or in any other kind of work incidental too, connected with the manufacturing process or the subject of the " " workers employed on days on which only maintenance work was carried on are, however excluded.

vi) Other than workers: This term includes all employees other than workers, as defined in (v) above.

vii) Man Hours: The estimate of the number of man-hours worked by a factory during the year relates to the entire year, including days on which no ~~fo~~ manufacturing operations were carried on and is calculated by multiplying the number of hours in shift, and aggregating the products for all the

an industry is the total number of manhours worked by all factories in that state or industry.

viii) **Wages:**

The term 'wages' has been used in the same sense as in section 2(vi) of the payment of wages Act, 1936, and means all remunerations capable of being expressed in terms of contract of employment, express or implied, were fulfilled, be payable, whether conditionally upon the regular attendance, good work or conduct or other behaviour of the person employed or otherwise, to a person employed in respect of his employment or of work done in such employment and includes any bonus or other additional remuneration of nature aforesaid which would be so payable, and any sum payable to such person by reason of the termination of his employment, but does not include.

(a) The value of any house accommodation, supply of light, water, medical attendance or other amenity or of any service excluded by general or special order of the State Government;

(b) Any contribution paid by the employed to any pension fund or provident Fund;

(c) Any travelling allowance or the value of any travelling concession;

(d) Any sum paid to the person employed to defray special expenses entailed on him by the nature of his employment; or

(e) Any gratuity payable on discharge".

ix) **Benefits:**

These include various benefits, over and above wages, such as free or subsidised housing foodgrains at concessional rates, etc.,

x) **Materials and fuels consumed:**

This excludes any fuel or material manufactured with in the factory and consumed in it. Electrical energy generated and consumed with in the factory is a case in point. The coal use ingenerating the energy is however included sinc it is brought into the factory from outside.

xi) **Value of factory of materials, fuel etc.,:**

This is the cost of materials etc., delivered at the factory, and includes the purchase price, transport charges and other incidental costs.

xii) **Amount paid to other concerns for work done for Factory:**

This term denotes the cost of services rendered to the factory by other concerns and by individuals other than its own employees.

xiii) **Products and By-Products manufactured for sale:**

This term includes products and by-products made during the year for sales whether actually sold during the year for not. It is generally estimated by adding sales during the year and stocks at the end of the year and deducting stock at the beginning of the year.

xiv) **Ex-Factory value of the Products and By-Products:**

Represents the value of products and by-products at factory, and i.e. exclusive of transport charges from the factory.

xv) **Amount received from others for work done for them:**

Work done for customers on payment, on materials supplied by them.

xvi) **Value added by manufacture:**

This represents that part of the value of product which if created in the factory, and if computed by deducting from the gross-exfactory value of output, the value of at

factory by other concerns, and depreciation of fixed assets. Depreciation is calculated at the rates allowed by the income tax authorities for assessing taxable income. The rate varies according to the type of assets and industry.

Annual Survey of Industries:

After 1958 the government has decided to change the pattern of Industrial enquiries and has adopted the method of surveying. The limitations of these survey can be had from general report of ANNUAL SURVEY OF INDUSTRIES 1959.

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